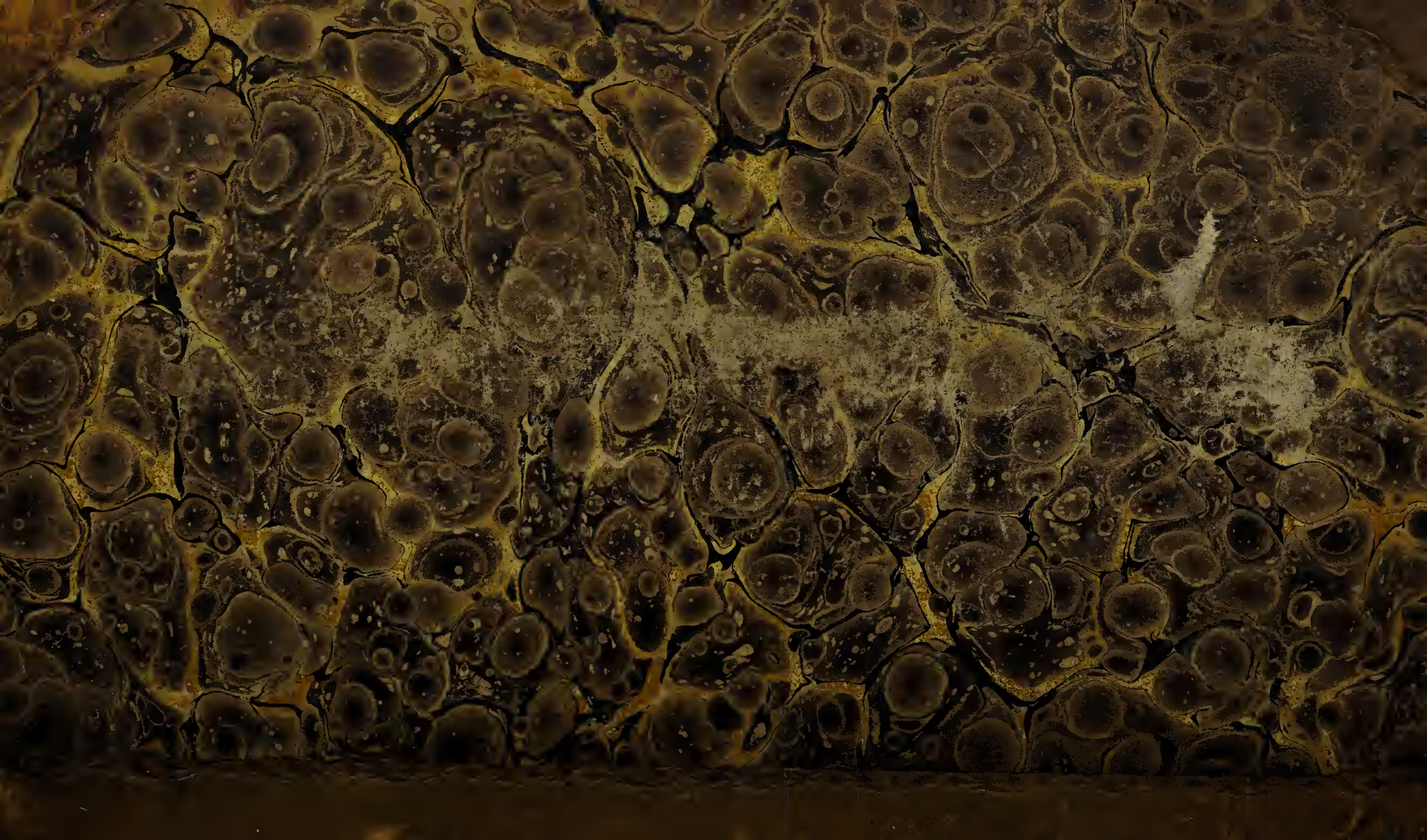

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REGISTER

OF THE

ARTS AND SCIENCES.

VOLUME THE FIRST,

CONTAINING

A CORRECT ACCOUNT OF SEVERAL HUNDRED OF THE MOST IMPORTANT AND INTERESTING

INVENTIONS, DISCOVERIES,

AND

PROCESSES.

ILLUSTRATED

WITH UPWARDS OF ONE HUNDRED ENGRAVINGS.

LONDON:

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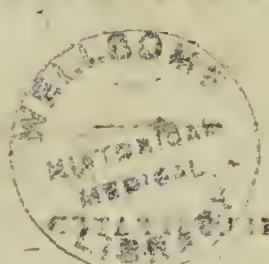

COE, PRINTER, DOCTORS' COMMONS.

ADDRESS.

THE completion of a First Volume is an era in the life of an Editor. It naturally brings with it a crowd of mingled feelings—of pleasure, anxiety, and regret—the accumulated mass of those which have agitated his mind during the past periods of his labour. It is then that he can the more properly review the general aspect of his work, and from the survey determine upon his future plans. He observes what appears defective and imperfect; and availing himself of his hardly bought experience, he re-arranges, alters, and re-models, as shall seem most accordant with the desires of those for whom his efforts are devoted. With the sense of his own failings and insufficiences, large promises of fine things to come thrust themselves upon him, and his pledges are as superlative as his hopes are splendid, and his intentions large. Such, at least, have been our feelings and impressions, in retracing the steps which we have taken in the conduct of our little Work.

Our objects were shortly detailed in the Prospectus appended to the First Part of the REGISTER. It would be unnecessary to quote it here, but we confidently refer to it as displaying our true and only intentions, and to the past Numbers as bearing us out in the declarations which it contains.

To our Correspondents we owe much: to their kindness and partiality we are indebted for many most clever, able, and ingenious papers; and from the increasing number and consequence of the Communications with which we are daily favoured, we incline to believe that the future will be found equally excellent and valuable with the past. To those who have evinced their favourable disposition towards us, but whose Communications we have been reluctantly compelled to notice in unfavourable terms, our thanks are alike due; and we have endeavoured to adopt such language in our replies as we thought best calculated to convey our dissent without wounding the kind feelings which prompted them. The answers which we have in some cases been obliged to make, have, we believe, sufficiently shown our sentiments of the flippant writers who have thought it necessary to address us uncivilly, and marked our sense of the quarter from which they sprung.

The Original Articles which have appeared—and some of them have occasioned us great cost and much difficulty in procuring—are, *we know*, considered favourably by those whose opinions are to us most valuable; and

the less refined, but equally convincing evidence of a widely extended sale, is but a public corroboration of their soundness and propriety.

As we have spared no pains, so we have grudged no expence in rendering the *matter* of our leading articles deserving of attention. Although the various subjects which the Work contains are distributed with apparently but little order (resulting in a great measure from the nature of the Work) it will be perceived that a classification is afforded by the Index, which will enable the reader at once to peruse all that the book contains upon each distinct subject. It has been our constant *aim* to give clear, concise, and faithful accounts, with such comments as the subjects appeared to require. In no instance have we attempted to distract, to perplex, or to mislead by our own remarks, directly, or by the more indirect though equally culpable means of crude notions and undigested enquiries; the introduction of which, whilst tending to no good purpose, could never fail to involve discussions, doubts, and difficulties, absurd enough when abstractedly considered, but most ruinous in their consequences to those whose habits and studies were insufficient to counteract the influence they might have excited.

We have no desire to mix up in this Address the litigious squabbles to which we have been forced; but whilst we advert to the implied importance of our Work, so complimentarily attached to it by some giant cotemporaries, we think it right to say, that in no case shall our sense of duty be affected by their abuse, or intimidated by their threats.

From the arrangements which we have made for the continuation of this Work, we feel assured that our next Volume will present an aspect of considerable improvement, to effect which no exertions on our part shall be wanting.

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ERRATA.

Page 3, line 25, for their office is in, read *the office in.*
—— 35, —— 37, —— has not, read *to have.*
—— 111, —— 30, —— many had, read *many have.*
—— 117, —— 34, —— arts, read *art.*
—— 119, —— 1, first two words omitted, viz. *until it.*
—— 159, —— 4, —— horrings, read *herrings.*
—— 188, —— 47, —— encounter, read *counteract.*
—— 192, —— 16. —— concession, read *concussion.*
—— 197, —— 42, first word, for as, read *and.*
—— 223, —— 25, —— inverterate, read *inveterate.*
—— 237, —— 42, —— caution, read *cautious.*
—— 243, —— 17, —— castor, read *caster.*
—— 358, —— 18, —— you you, read *that you.*

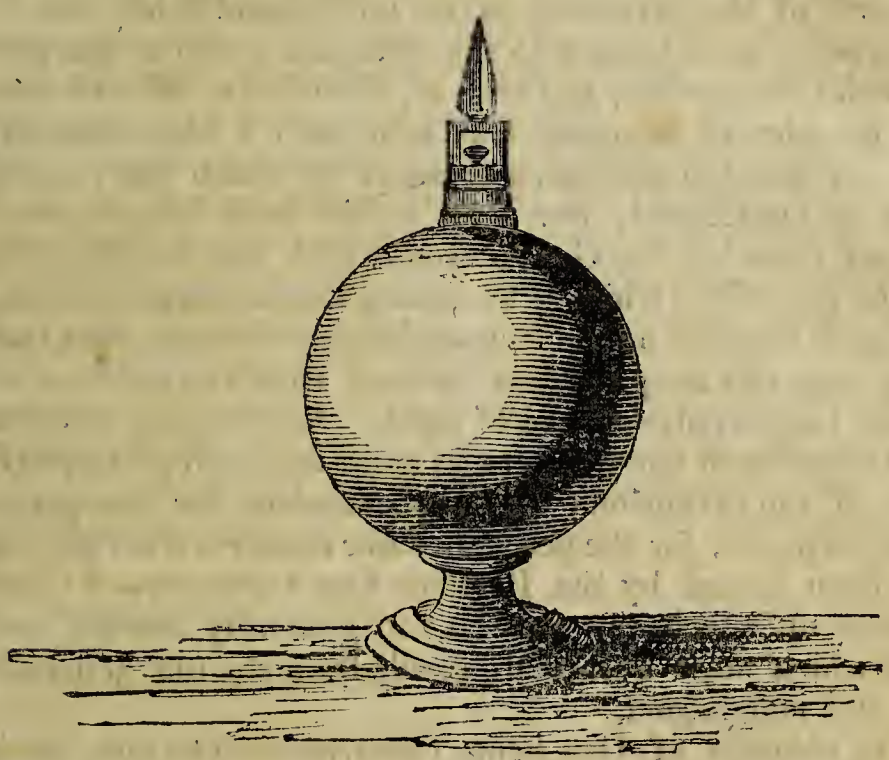
REGISTER

OF

THE ARTS AND SCIENCES,

IMPROVEMENTS & DISCOVERIES.

No. I.] SATURDAY, OCTOBER 18, 1823. [Price 3*d.*



THE PORTABLE GAS LAMP.

When Mr. Windsor first promulged the idea of Gas Illumination, it was generally considered as either a pleasant hoax upon the public credulity, or as the feverish result of an unsound speculation. The thing was so absurd and impracticable, and its possibility so utterly destitute of all physical foundation, that it seemed to bear in itself the germs of its own refutation. The conceit, however, was sufficiently quaint and original to provoke discussion, enquiry, and calculation; and as each succeeding hour served but to dissipate the ridicule, and sober down the laugh of contempt to a meditative pucker, the difficulties and the obstacles were one by one removed, till at length all London shone forth in a blaze of splendour, brilliancy, and beauty.

Although this so long wished for desideratum was thus realized, it was soon found that its advantages were partial and restricted; for as it was necessary that each individual light should remain immoveably fixed, and emanate and be supplied from one great and distant source, it was consequently impossible to render it so generally available as the less effulgent flame it was now to supersede. It became, therefore, a subject of consideration to scientific men to devise some method by means of which this impediment might be

gotten over, and although the accomplishment of this object must have been wrought by many an anxious experiment, and the attempt have been beset with the utmost difficulties in making it subservient to any efficient purpose, we are happy in being now enabled to state that all these have been surmounted, and that this splendid light will in all human probability be ultimately diffused through every chamber in every house in the kingdom, whether for the purposes of domestic employment or of artificial magnificence, by means of the PORTABLE GAS LAMP.

The merit of the invention is we understand solely due to Mr. DAVID GORDON, well known to the scientific world as the projector of many useful discoveries, and who is, we believe, the first that ever conceived the idea of bringing Gas into such a high state of condensation. When the enormous pressure to which the vessels must be subject is considered, few men would have contemplated the possibility of allowing the Gas to escape with that degree of nicety, delicacy, and precision, which is necessary for the purpose of ignition: but this mighty obstacle he has so completely overcome, that the flame proceeding from the lamp may be reduced from the greatest altitude to an almost imperceptible bead of light. We propose to ourselves, in the next Number of our work, to go more fully and particularly into the nature of the invention; limiting ourselves for the present to giving some extracts, for the perusal of our readers, from the Circular which has been issued by the Portable Gas Company—a Company, the existence of which can not be too generally known, and the advantages which must eventually result from it, too generally disseminated and understood.

"Thirty volumes of Gas being compressed into one, no inconvenience will arise from the size of the gas lamps; and as all the reservoirs of the lamps have been proved to be able to resist upwards of 200 pounds on the square inch above the pressure to which they are to be subjected when filled with Compressed Gas for consumption, no possible danger can arise in the use of them.

"It is calculated that six feet of the best Oil Gas will give a quantity of light equal to one pound of wax candles; and the Company propose to supply regular customers with that quantity at about one half the price of one pound of tallow candles.

"The reservoirs of the gas lamps are either of a globular or cylindrical form, and the exhausted reservoirs will be daily removed by the Company's servants, and replaced by others newly filled, so that regular customers will be always in possession of their required supply.

"The advantages of Oil Gas are, that being free from sulphurated hydrogen, it will not injure metallic goods, pictures, elegant bindings of books, or gilded furniture of any description; and will give out, when burning, only one half the heat of Coal Gas. And the further advantages arising from the portable form in which it is now offered are,

"First,—That from being moveable a less quantity of light will be required in an apartment than when the light is fixed in one place.

"Secondly,—That it is capable of being economized, as a great or small number of the lamps may be lighted, and the strength of the flame diminished or increased at pleasure: the customer paying for no more gas than is used. And,

"Thirdly—That the gas may be used in situations where it is impossible in any other manner to convey gas lights.

"From the safety and cleanness of portable gas, it will be found particularly calculated for milliners, dress-makers, tailors, lace-makers, and for all manufactures of delicate fabrics, and generally for bankers, public offices, coffee-houses, taverns, shops, &c. as, independent of other advantages, the lamps may always be ready to be lighted upon any unforeseen emergency.

"It is proper to mention, that no explosive mixture can be formed by the escape of gas from the portable gas lamps, because to produce such, a much greater quantity of gas would be necessary than the whole supply required for one house, even supposing all the gas in the reservoirs were at once liberated in the smallest room.

"The customers desirous to have a regular supply of Compressed Oil Gas from the Company will fix upon the size of the lamps which are required to be furnished, and agree how often they are to be replenished; which will be done by exchanging lamps in every respect the same, properly filled with gas, for those that are exhausted."

The Portable Gas-works are in St. John Street, Clerkenwell; and their Office is in Basinghall Street,—where we were favoured, in common with the public, with a sight of a great variety of elegant lamps filled with the Compressed Oil Gas, which are lighted at pleasure for the satisfaction of applicants, and every circumstance relating to them clearly explained.

GALVANIC EXPERIMENTS ON THE DEAD BODY OF A CRIMINAL.

Among the many curious galvanic experiments that have been made on the human body, there are none of which the effects have been so wonderful as in those performed by Dr. Ure, of Glasgow. The following is the Doctor's own account of the experiments:—

The subject of these experiments was a middle-sized, athletic and extremely muscular man, about thirty years of age. He was suspended from the gallows nearly an hour, and made no convulsive struggle after he dropped; while a thief, executed along with him was violently agitated for a considerable time. He was brought to the anatomical theatre of our university in about ten minutes after he was cut down. His face had a perfectly natural aspect, being neither livid nor tumefied; and there was no dislocation of his neck.

Dr. Jeffray, the distinguished professor of anatomy, having the preceding day requested me to perform the galvanic experiments, I sent to his theatre with this view, next morning, my minor voltaic battery, consisting of 270 pairs of four inch plates, with wires of com-

munication, and pointed metallic rods with insulating handles, for the more commodious application of the electric power. About five minutes before the police officers arrived with the body, the battery was charged with a dilute nitro-sulphuric acid, which speedily brought it into a state of intense action. The dissections were skilfully executed by Mr. Marshall, under the superintendance of the professor.

Exp. 1. A large incision was made into the nape of the neck, close below the occiput. The posterior half of the atlas vertebra was then removed by bone forceps, when the spinal marrow was brought into view. A profuse flow of liquid blood gushed from the wound, inundating the floor. A considerable incision was at the same time made in the left hip, through the great glutteal muscle so as to bring the sciatic nerve into sight, and a small cut was made in the heel, from neither of these did any blood flow; the pointed rod connected with one end of the battery was now placed in contact with the spinal marrow while the other rod was applied to the sciatic nerve. Every muscle of the body was immediately agitated with convulsive movements resembling a violent shuddering from cold; the left side was most powerfully convulsed at each renewal of the electric contact. On moving the second rod from the hip to the heel, the knee being previously bent, the leg was thrown out with such violence as nearly to overturn one of the assistants, who in vain attempted to prevent its extension.

Exp. 2.—The left phrenic nerve was now laid bare at the outer edge of the *sternothyroideus* muscle, from three to four inches above the clavicle, the cutaneous incision having been made by the side of the sternocleido mastoideus. Since this nerve is distributed to the diaphragm, and since it communicates with the heart through the eighth pair, it was expected, by transmitting the galvanic power along it, that the respiratory process would be renewed. Accordingly a small incision having been made under the cartilage of the seventh rib, the point of the one insulating rod was brought into contact, with the great head of the diaphragm, while the other point was applied to the phrenic nerve in the neck. This muscle, the main agent of respiration, was instantly contracted, but with less force than was expected. Satisfied from ample experience on the living body, that more powerful effects can be produced in galvanic excitation, by leaving the extreme communicating rods, in close contact, with the parts to be operated on, while the electric chain or circuit is completed by running the end of the wires along the top of the plates, in the last trough of either pole, the other wire being steadily immersed in the last cell of the opposite pole, I had immediate recourse to this method. The success of it was truly wonderful. Full, nay, labourious breathing, instantly commenced. The chest heaved, and fell; the belly was protruded, and again collapsed, with the relaxing, and retiring diaphragm. This process was continued without interruption, as long as I continued the electric discharges.

In the judgment of many scientific gentlemen who witnessed the

scene, this respiratory experiment was perhaps the most striking ever made with a philosophical apparatus. Let it also be remembered, that for full half an hour, before this period, the body, had been well nigh drained of its blood, and the spinal marrow severely lacerated No pulsation could be perceived meanwhile at the heart or wrist; but it may be supposed, that but for the evacuation of blood, the essential stimulus of that organ, this phenomenon might also have occurred.

Exp. 3.—The supra-orbital nerve was laid bare in the forehead, as it issues through the supra-ciliary *foramen*, in the eyebrow: the one conducting rod being applied to it, and the other to the heel, most extraordinary grimaces were exhibited every time that the electric discharges were made, by running the wire in my hand along the edges of the last trough, from the 220th to the 270th pair of plates: thus fifty shocks, each greater than the preceding one, were given in two seconds. Every muscle in his countenance was simultaneously thrown into fearful action; rage, horror, despair, anguish, and ghastly smiles, united their hideous expression in the murderer's face; surpassing far the wildest representations of a Fuseli or a Kean. At this period several of the spectators were forced to leave the apartment from terror or sickness, and one gentleman fainted.

Exp. 4.—The last galvanic experiment consisted in transmitting the electric power from the spinal marrow to the ulnar nerve, as it passes by the internal condyle to the elbow: the fingers now moved nimbly, like those of a violin performer; an assistant, who tried to close the fist, found the hand to open forcibly, in spite of his efforts. When the one rod was applied to a slight incision in the tip of the forefinger, the fist being previously clenched, that finger extended instantly; and from the convulsive agitation of the arm, he seemed to point to the different spectators, some of whom thought he had come to life. About an hour was spent in these operations.

In deliberating on the above galvanic phenomena, we are almost willing to imagine, that if, without cutting into and wounding the spinal marrow and blood vessels in the neck, the pulmonary organs had been set a playing at first, (as I proposed) by electrifying the phrenic nerve, (which may be done without any dangerous incision) there is a probability that life might have been restored. This event, however, little desirable with a murderer, and perhaps contrary to law, would yet have been pardonable in one instance, as it would have been highly honourable and useful to science. From the accurate experiments of Dr. Philip it appears, that the action of the diaphragm and lungs is indispensible towards the restoring the suspended action of the heart and great vessels, subservient to the circulation of the blood.

It is known, that in cases of death-like lethargy, or suspended animation, from disease and accidents have occurred, where life has returned after longer interruption of its functions than in the subject of the preceding experiments. It is probable, when apparent death supervenes from suffocation with noxious gasses, &c. and when there is no laesion, that a judiciously directed galvanic experiment will, if

any thing will, restore the activity of the vital functions, The plans of administering voltaic electricity hitherto pursued in such cases, are, in my humble apprehension, very defective. No advantage, we perceive, is likely to accrue from passing electric discharges across the chest, directly through the heart and lungs. On the principles so well developed by Dr. Philip, and now illustrated on Clydesdale's body, we should transmit along the channel of the nerves, the substitute for nervous influence, or that power which may perchance awaken its dormant faculties. Then, indeed, fair hopes may be formed of deriving extensive benefit from galvanism; and of raising this wonderful agent to its expected rank among the ministers of health and life to man.

SOFT IRON THAT WILL CUT HARDENED STEEL.

In the London Journal of Arts and Sciences for the present month, is the following notice of what is called a discovery.

"It has recently been *discovered* that a thin circular plate of soft iron, made to revolve with very great velocity, will cut hardened steel. The circumstances which led to this *discovery* were, an attempt to reduce the diameter of a circular iron plate by placing it in a lathe and applying a file to its edge; instead of the file reducing the plate, it was perceived that the plate made inroads upon the file, and every attempt to reduce the plate by hardened steel instruments proved inefficient, while it revolved with the rapidity there given to it. This singular effect has been noticed in the American Journals, where it was first *discovered*,—but we understand that it has not been applied in that country to any useful purpose.

"Mr. Perkins has tried the experiment in London with complete success—by placing a circular plate of soft iron one twentieth of an inch thick in a lathe, and when it was made to revolve with a speed equal to ten thousand feet of its circumference in a minute, deep incisions were made by the iron in a common steel file. The theory of this operation is not exactly made out; it is, however, supposed to have some connexion with *magnetism*."

We find it difficult to conceive how scientific men should be puzzled to account for the effect produced upon the steel,—and we think it would have puzzled still more the *unlearned* mechanic had the effect been any other than that described. Here are ten thousand feet of the periphery of the circular plate rubbed violently against a portion of the file not exceeding an eighth of an inch where it touches. A clearer idea will be afforded of the velocity and consequent force with which the iron strikes against the file, by bringing the ten thousand feet into eighths of inches, which makes 960,000—so that the steel receives that number of rubs in a minute of time, or 16,000 in a second of time, (producing a heat which we should suppose to be sufficient to fuse the steel), the friction upon the file being unremitting; while the friction upon the iron plate, (supposing it to be 8 inches in diameter) was about 200 times less than that of the file, the plate being cooled also in its passage through the air at every

revolution. Thus, then, it would appear that the steel received perhaps 400 times more heat than the iron, while it has not the capacity to receive an equal quantity without being melted. A proof of which is perhaps afforded by what is called "*striking a light*" with flint and steel. By the collision, a portion of the steel struck off is ignited and melted; while a blow of equal force upon iron, with a flint, will produce no such effect. Again, iron will retain its solid form at what is called a welding heat,—which is a degree of heat at which steel passes into the fluid state.

Valuable Information to Smiths, and other Branches of the Metal Trade, communicated by Mr. A. Seibe, *of the Strand, to the Editor of the London Journal, for the Service of the Public.*

"Sir,

"Having observed in the number of your Journal for June last, and also in the present of September, an account of Welding together the edges of thin Plate Iron, and understanding that the material used as a flux, is considered to be a secret, and confined to the few persons who practise it; without knowing any thing of the materials employed at Birmingham, or in America, I beg to inform you, that I have invented, and for some years practised a mode of welding together two thicknesses of cast steel, or iron and cast steel, which process of welding is performed at a temperature very little above a red heat.

"I send you herewith several specimens of welding, two pieces of cast steel together, of iron and cast steel, and of thin sheet iron alone, and also an account of the process and materials employed.

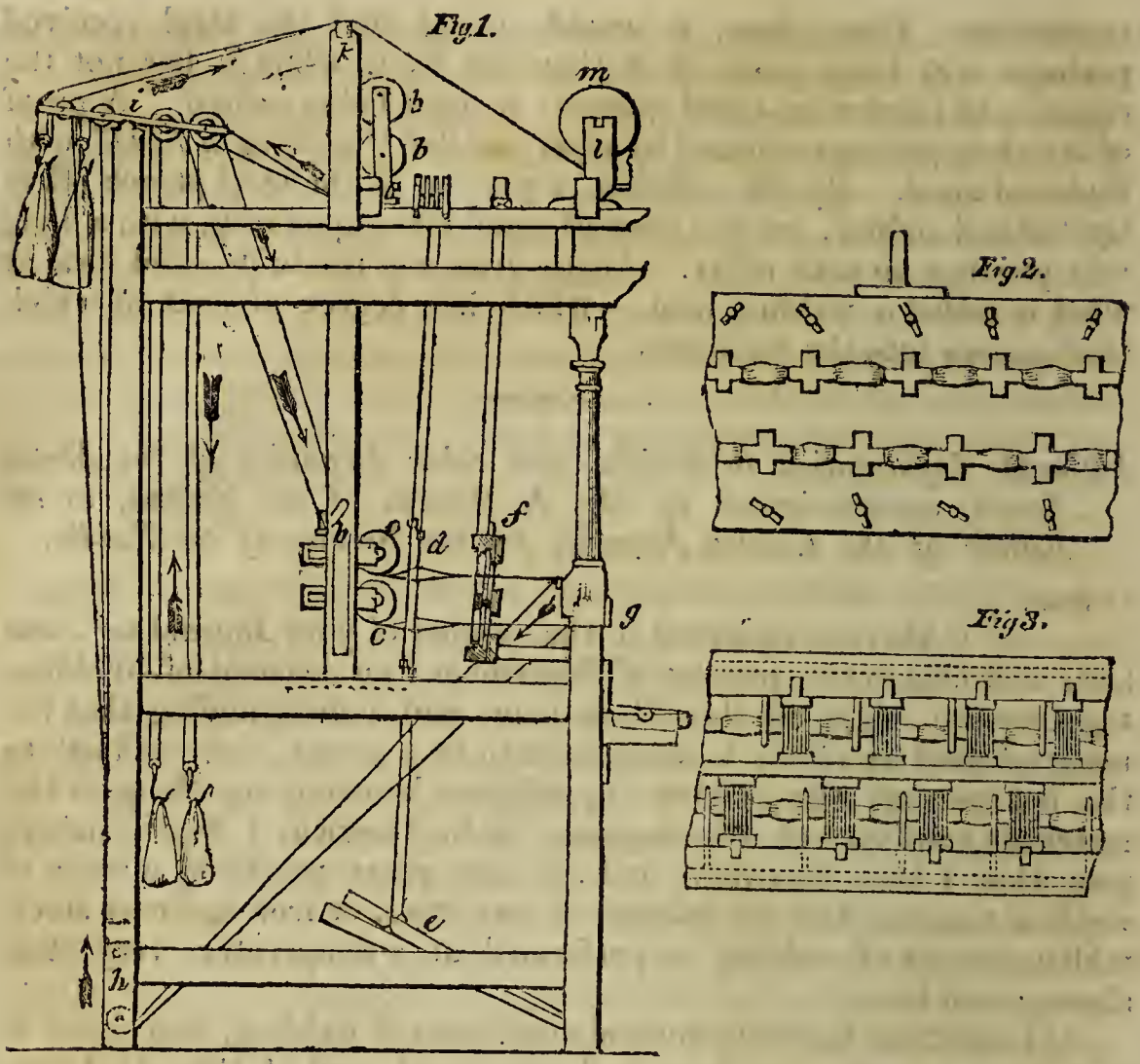
"I melt borax in an earthen vessel, not in a metallic one, particularly brass or copper; after melting, one tenth of sal-ammoniac is pounded and mixed with it: the two substances being well incorporated together in the fire, it is to be poured out on to an iron plate, and when cold, will produce a substance resembling glass; it is then to be pulverized, and mixed with an equal quantity of unslaked, which makes it fit for use.

"In performing the operation of welding, the iron or steel must first be heated to a red heat, and then the pounded material scattered upon the surface, which will melt and run over it like sealing wax. The iron or steel is then to be again introduced into the fire, and raised to a heat considerably below the ordinary welding heat, (which proves itself by the cast steel) when it is to be withdrawn, and immediately beaten by a hammer, until the surfaces are perfectly welded together.

"The composition is an invention of my own, and I have proved it for some years with never-failing success. Anxious to add my mite from time to time, to the advancement of the Arts, if this piece of information is considered by you as deserving a place in a scientific work, it is very much at your service, and the service of the public.

"I am, Sir, Yours, &c.

"AUGUSTUS SEIBE."



MR. GOODMAN'S IMPROVED SILK LOOM.

(Patent inrolled March, 1823.)

THESE improvements apply to that description of Looms usually employed for the weaving of narrow articles, such as tapes and ribbons, (commonly called Dutch engine Looms) and consist, principally, in a novel arrangement of the shuttles and slays in the battens. The general appearance of the Loom, with its improvements, will be seen in *Fig.* 1. which is an end view of the Loom, shewing the disposition of the warps for two sets of shuttles. *Fig.* 2. shews a part of the front of the batten; and *Fig.* 3, the back of the same; by which the situation of the shuttles, and manner of fixing the slays will be seen, and also the construction of the driver. The front of the batten *Fig.* 2. is formed by three planks, one of which is fixed to the top rail, by a series of slay screws; the bottom plank is secured to the lower rail in a similar manner; and the middle plank is fastened to the slay rail by a series of screws or pins, as seen in the back view, *Fig.* 3. These screws must have shoulders, in order to leave an open space between the back of the plank and the slay rail, for the action of the drivers.

The shuttles, made according to the ordinary construction, are introduced in the races between the planks and the horizontal action of the drivers impels them to and fro through the warp, in the usual manner The driver in the ordinary engine Loom is formed like a

ladder, but in this improved Loom it is made with teeth extending from the top and bottom rails of its frame, shewn by dots; and these teeth may, if it should be thought desirable, be united together for the purpose of giving them stability, by diagonal pieces crossing the middle of the batten.

The general operation of the Loom will be understood by the following description: *b, b, Fig.* 1, are the rollers, upon which a sufficient quantity of the material is wound, to form two warps; from thence the threads proceed (as shewn by arrows in the figure) in the usual way, up and down over the weighted pullies, to the back slays *b*; then under the warp rollers *c* to the leashes *d*, which are looped to arrange with each set of warps, and through which each distinct warp passes to its respective slay. The raising and depression of the treadles *e*, worked by the feet of the weaver, cause the leashes alternately to move up or down, by which the warp threads are opened; the batten *f*, is then pushed back, and the shuttles passed through the open space between the threads. The shifting of the treadles and leashes now causes the intervention of the threads to be made fast, which are beaten up firm, by bringing the batten *f*, forward. The continued action of the Loom in this manner, and the passing of the shuttles to and fro, produces that intervention of the waft and weft which is the ordinary operation of weaving.

The work thus woven, is drawn off through small apertures in the breast pieces *g*, and thence proceeds to the work roller *h*, over which it passes up the back castle *i*, where it is distended by the weighted bags and pullies; from thence it is carried over the top castle *k*, and through holes in the work castle *l*, where it is made fast by wedges, to prevent it from running back, and as the length of the work accumulates, it is wound round the bobbins *m*.

Although it has been thought necessary to describe the whole construction and operation of this improved Engine Loom, yet it is to be understood, that the invention claimed by the Patentee consists merely "in the new arrangement of the shuttles and the slays, as connected with the batten and the knitting of the leashes, to arrange with the same in the manner above described."

A VALUABLE GREEN COLOUR EXTRACTED FROM COFFEE BERRIES.

At Venice a certain method has been lately discovered for composing a fine unchangeable emerald Green Colour. A certain quantity of coffee is boiled in river water; spoiled coffee (café avarié) is preferable. By means of a proportionate quantity of pure soda a green precipitate is obtained, which is suffered to dry for six or seven days upon polished marble, stirring it about occasionally, in order that every part may come in contact with the atmosphere, from which it receives a new vivacity of tint. The green lake obtained by this process has resisted the action of the acids, and even the influence of light and moisture.

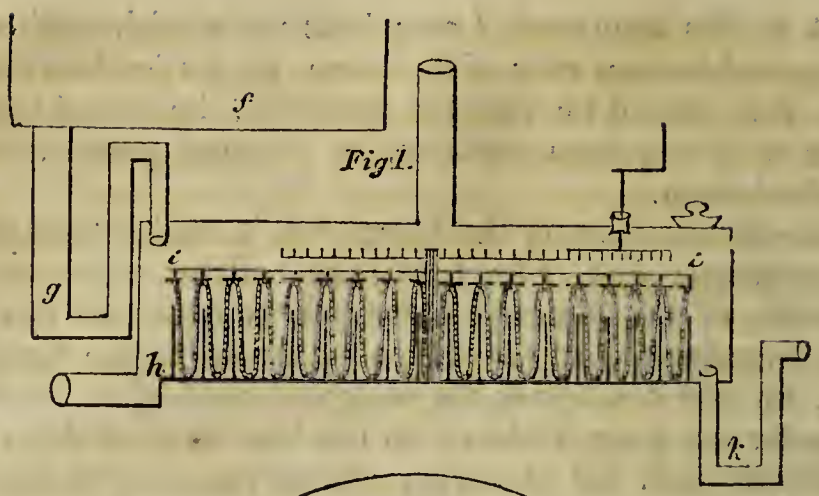


Fig. 1.

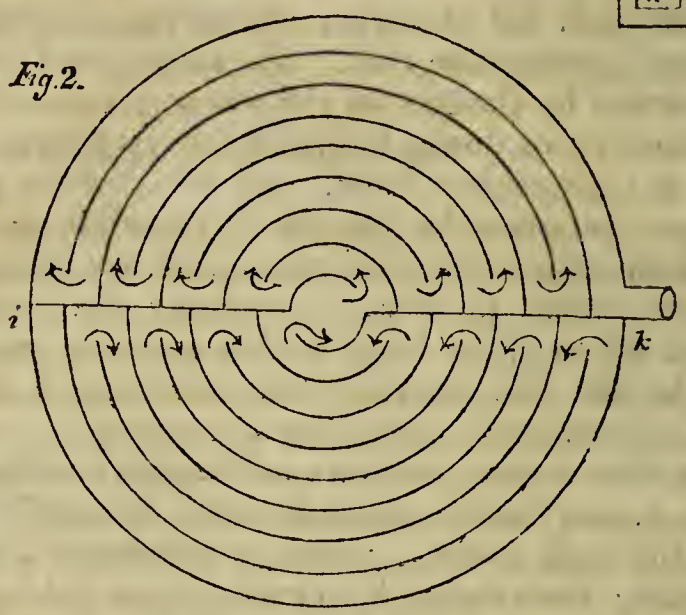


Fig. 2.

SIR ANTHONY PERRIER'S IMPROVED APPARATUS FOR DISTILLATION.

The object in this invention is to cause the liquid to flow gradually over the heated surface of the cucurbite or body of the still, and during its progress to give out its spirituous evaporation. The quantity of liquid allowed to be acted upon, or to pass through the still in a given time, and also its velocity, is regulated by the circuitous route in which it proceeds, and by that means, the complete operation of the fire upon the whole of the fluid is insured, and the evaporation of the spirit is not impeded by aqueous, or empyreumatic vapours. By this construction of a still, a continued and uninterrupted distillation, or evaporation, is effected or carried on without intermission, as long as the supply of liquid is furnished, and the fire kept up.

Fig. 1. is *a view in profile* of the section of a still, or boiler, made on the improved principle of copper, or any other suitable material, and *Fig.* 2. is a plan of the same. The bottom of this boiler is divided by concentric partitions, which stand up as shewn in *Fig.* 1, sufficiently high to prevent the liquor from boiling over. These partitions have openings from one to the other, at opposite sides, so as to make the course a sort of labyrinth : *f* is a reservoir of liquor prepared for the operation, *g* is a pipe or tube descending from the reservoir, and conducting the liquor to that part of the boiler marked

k, which is the commencement of the race. From hence, the liquor flows through the channels, as shewn by the bent arrows, progressively traversing the whole surface of the bottom, whereby the full effect of the fire is exerted upon small portions of the liquid, which causes the evaporation to proceed with great rapidity. The residue of the liquor then passes off by the discharge-pipe *i*, which is made to slide for the purpose of regulating the quantity and depth of the fluid to be operated upon in the still; and this pipe should be in such proportion to the admission pipe as to cause the perfect distillation of the liquor in its passage to the regulating tube.

The spirit which rises in the head of this improved still will be found much stronger and purer than that obtained by the ordinary construction of stills, where the spirituous vapour is generally very much contaminated with impurities. The channels may be extended to any required length, over a bottom of any dimensions, by contracting their breadth.

Stills, upon this principle, may be made of all sizes and shapes; and the partitions may be placed in concentric or excentric circles, with openings in their sides, at such distances, as shall cause the liquor to flow over the most extended surface of the bottom.

The bottoms of these stills may be either flat, concave, convex, conical, or of any other form, and the entrance of the liquor into the still, and also its discharging aperture may be at the side, in the middle, or elsewhere, as circumstances may dictate.

Boilers, or evaporators, may be made upon this plan, either with or without heads, and in all cases their capacity for working may be increased by placing layers of pipes connected thereto within the flues, between the still and chimneys, which pipes may be bent or coiled in a serpentine direction, or in any other position, and the liquor to be operated upon made to pass through them previous to its entering the still, by which means the operation may be advanced to any required state of forwardness.

Stills of the above description, particularly if made square, may be divided internally into several stills, each having its separate head and condenser, by which arrangement, the spirit condensed from the first still may fall into the second, to be again operated upon, and so on to a third, whereby a rectification may be carried on to any degree at one operation, and by one fire.

In the still as shewn at *Fig.* 1. a set of chains are seen suspended from a bar *i i*, supported by a centre shaft, which may be put in motion by a toothed wheel and pinion, actuated by a crank or winch. These chains hang in loops and fall into the spaces between the partitions, for the purpose of sweeping the bottom of the still as the shaft revolves, and preventing the material operated upon from burning, when of a thick or glutinous nature, as turpentine, syrups, &c.

The foregoing descriptions of stills have been considered as in immediate contact with the fire; but the inventor has proposed other apparatus for working them by steam, or a water bath, which is, undoubtedly, a far superior method, for obtaining a pure spirit,

untainted with empyreuma. Upon the whole, great credit is due to the inventor for the ingenuity of his improvements, which, however, we do not consider as quite original, the same principle of allowing the liquid to flow gradually in small streams over the heated surface of the vessel, having, to our knowledge, long since been applied to the condensation of liquids by evaporation.

THE ELEMENTS OF NATURAL PHILOSOPHY.

No. I.—The Properties of Matter.

1. Matter is the name given to every substance or thing, which possesses length, breadth, and thickness.

The nature of matter has in all ages furnished a subject of discussion and enquiry to philosophers, but no satisfactory result has ever yet been attained. The knowledge which we now possess is merely relative to our own powers and senses; and these relative properties are therefore the object of philosophical research.

2. The properties of Matter are Solidity, Divisibility, Mobility, and Inertness.

3. *Solidity* is that property which all substances possess of not permitting any other substance to occupy the same place at the same time.

This is so easily understood as to need no illustration.

4. *Divisibility* is that property by which parts of a substance may be divided from each other.

This property is illimitable. Matter can never be annihilated by division; so that we cannot conceive any part of it so small but we may suppose a smaller. It would therefore be absurd to say that the greatest mass or body of substance has more halves and quarters or millionth parts, than the smallest inconceivable particle of matter.

Many interesting calculations have been gone into for the purpose of illustrating this fact, from which we have selected the following. Mr. Leewenhoeek informs us that there are animalculæ so small that many thousands of them taken together are smaller than the point of a needle! and that there are more animals in the milt of a cod-fish than there are men on the whole earth; and a single grain of sand is larger than four millions of these animals! Moreover, that a particle of the blood of one of these animalculæ, has been found, by calculation, to be as much smaller than a globe of the 1-10th of an inch in diameter, as that globe is smaller than the whole earth.

5. *Mobility* is that property of matter by which it is capable of being transferred, or moved, from one place to another.

It is therefore an axiom that all matter is capable of being moved, if a sufficient force can be applied for that purpose.

6. *Inertness* is that property by which matter would always continue in the same state of rest, or of motion, unless that state were changed by means of some external force.

For example, a stone will never move unless it be in some way acted upon by a power independent of it; nor would a cannon ball,

if propelled with sufficient power, ever attain a state of rest, or cease its perpetual revolution round the earth, were it not for the resistance of the air.

7. Besides the inactive principles of matter, there are certain active powers or principles of motion whereby bodies are carried from or towards each other, according to fixed and determined laws, which may be termed the laws of *attraction* and *repulsion*.

8. By attraction is meant the tendency that bodies have to approach each other, whatever be the cause.

9. There are five kinds of attraction :

1. The attraction of *Cohesion*.
2. The attraction of *Gravitation*.
3. The attraction of *Electricity*.
4. The attraction of *Magnetism*.
5. The attraction of *Chemical Affinity*.

10. The attraction of *Cohesion* is that by which the particles of bodies are made to *adhere* and preserve their unity.

If two pieces of lead be scraped very clean and pressed closely together, the adhesion will be so great as to require a considerable force to separate them.

11. The attraction of *Gravitation*, or GRAVITY, is that force, by which distant bodies are drawn towards each other.

By Gravity, a stone dropped from a height falls towards the surface of the earth.

All heavy bodies near the earth tend to its centre with a force proportional to their quantity of matter, and in all places equally distant from the centre of the earth the force of gravity is equal.

The force of gravity is strongest of all at the surface of the earth; for below the surface it decreases with the distance, and above the surface it decreases, as the squares of the distance increase.

12. The attraction of *Electricity*, of *Magnetism*, and of *Chemical Affinity*, seems to be of a like nature with these principles.

13. Where the force of attraction ends, a new force, called REPULSION, begins.

14. If the distance of two particles be so great that the sphere of attraction cannot reach from one to the other, they will fly from, or *repel* each other, with a force that increases as the distance of the particles decrease.

15. When a particle that is repelled is forced within the sphere of attraction, it will be *attracted*; and when a particle that is held by attraction is thrown off by some superior force beyond the sphere of attraction, it will be *repelled*.

16. Those particles that are attracted most strongly when within the sphere, will be repelled most forcibly when without it.

Water will repel most bodies till they are wet. A small sewing needle will swim in a basin of water—and from the same cause flies will walk on it without wetting their feet.

[It would, in strictness, be right to simplify these principles by the illustrations which experiments afford; but we conceive them to be so plain and comprehensible, that we have purposely abstained

from doing so. The mind, with a little reflection, will easily be able to supply them; and we must not, unnecessarily, swell our papers upon one subject, when the amplification would only go to the exclusion of others.]

THE ANCIENT ART OF ENCAUSTIC PAINTING.

In the elegant arts of Designing and Painting, the Ancients acquired a degree of perfection which may well vie with that of later ages. Those who have studied the history of these arts, compiled by Pliny, must be convinced, that there is scarcely a style of modern drawing or colouring which was not known to the Greeks, who united to these exquisite accomplishments all the collateral ramifications of embroidery, tapestry, brocading, damask-work, and every species of mosaic; which, according to the Roman historian, had a different name to each.

Among the many proofs of their ingenuity, that of Encaustic Painting deserves our particular notice,—it being obviously invented for the sake of duration. From the meagre account given to us by Pliny of the method, it is evident he was not in the secret himself. All the information we can gather from him seems to amount to this: that the colours made use of were fixed by fire, and that wax was employed to give them a gloss, and preserve them from being injured by the air.

This ancient art, after having been long lost, was restored by Count Caylus, a member of the Academy of Inscriptions, in France; and the method of Painting in Wax was announced to the Academy of Painting and Belles-Lettres in the year 1753; though M. Bachelier, the author of a treatise "De l'Histoire et du Secret de la Peinture en Cire," had actually painted a picture in wax in 1749, and he was the first who communicated to the public the method of performing the operation of inustion, which is the principal characteristic of the Encaustic Painting. The Count kept his method a secret for some time; contenting himself with exhibiting a picture at the Louvre, in 1754, representing the Head of Minerva, painted in the manner of the Ancients, which excited the curiosity of the public and was very much admired.

Almost all the colours that are used in Oil Painting, may be also applied in the Encaustic method; and many which cannot be admitted in Oil Painting, as red lead, red orpiment, crystals of verdigris, and red precipitate of mercury, may be used here. The crayons used in Encaustic Painting are the same with those used in the common way of Crayon Painting, excepting those that in their composition are too tenacious; and the method of using them is the same in both cases.

The Encaustic Painting has many peculiar advantages; though the colours have not the natural varnish or shining which they acquire with oil, they have all the strength of paintings in oil, and all the airiness of water colours, without partaking of the apparent character or defects of either; they may be looked at in any light, and in any situation, without any false glare; the colours are firm and will bear

washing; and a picture, after having been smoked and then exposed to the dew, *becomes as clean as if it had been just painted.* It may also be retouched at pleasure without any detriment to the colours, for the new colours will unite with the old ones, without spots, as is the case in common Size Painting; nor is it necessary to rub the places to be retouched with oil as in old pictures; it is not liable to crack, and is easily repaired, if it should chance to suffer any injury. The duration of this painting is also a very material advantage; the colours are not liable to fade or change, no damp can affect them, nor any corrosive substance injure them, nor can the colour fall off in scales from the canvas. However, notwithstanding all these and other advantages enumerated by the Abbé Mazaes and Mr. Muntz, this art has not yet been much practised. Many of these properties belong to a much higher species of Encaustic Painting, afterwards discovered in England, the colours of which are fixed by a very intense heat; nor are the colours or grounds on which they are laid liable to be dissolved or corroded by any chemical menstruum; nor, like the glassy colours of enamel, to run out of the drawing on the fire. This method is described in the second part of the 49th volume of the "Philosophical Transactions."

(To be concluded in our next.)

DEW.

Aristotle justly remarked, that dew appears only on calm and clear nights. Dr. Wills shews that very little is ever deposited in opposite circumstances; and that little only when the clouds are very high. It is never seen on nights both cloudy and windy; and if in the course of the night the weather, from being serene, should become dark and stormy, dew which had been deposited will disappear. In calm weather, if the sky be partially covered with clouds, more dew will appear than if it were entirely uncovered.

BURNING GLASS.

Sir Isaac Newton presented a burning glass to the Royal Society, which consisted of seven concave glasses, so placed that all their foci join in one physical point. This instrument vitrifies brick or tile in one second, and melts gold in half a minute.

ARITHMETICAL PARADOX.

In an Arabian manuscript was found the following remarkable decision of a dispute:—Two Arabians sat down to dinner; one had five loaves, the other three. A stranger passing by, desired permission to eat with them, which they agreed to. The stranger dined, laid down eight pieces of money, and departed. The proprietor of the five loaves took up five pieces, and left three for the other, who objected, and insisted upon one half. The cause came

on before Ali, the magistrate, who gave the following judgment:—"Let the owner of the five loaves have seven pieces of money, and the owner of three loaves one." *Query.* The justice of the sentence? *Answer.* Ali's sentence was just; for supposing each loaf divided into three equal parts, making twenty-four parts in all the eight loaves, and each person to eat an equal or eighth part:—therefore, the stranger had seven parts of the person who contributed five loaves, or fifteen parts: and only one of him who had contributed three loaves, which make nine parts.

LIST OF NEW PATENTS.

R. Higgins, of Norwich; for a new or improved method of consuming or destroying smoke. August 18th, 1823.

G. Diggles, College Street, Westminster; for an improved bit for riding-horses, and for horses used in single and double harness. August 19th, 1823.

E. Elwell, of Wednesbury-forge, Staffordshire; for improvements in the manufacture of spades and shovels. August 20th, 1823.

M. A. Robinson, of Red Lion Street, Middlesex; for improvements in the mode of preparing the vegetable matter, commonly called pearl barley, and grits, or grotts, made from the corns of barley and oats, by which material, when so prepared, a superior mucilaginous beverage may be produced in a few minutes. August 20th, 1823.

J. Good, of Tottenham; for improvements in machinery, tools, or apparatus, for boring the earth, for the purpose of obtaining and raising water. August 20th, 1823.

TO OUR READERS AND CORRESPONDENTS.

It would be as much opposed to our interests as to our inclination in the commencement of this work, to make pledges which it would not be in our power or our purpose to redeem; or to chalk out to ourselves a course of conduct which we never seriously intended to follow. It is therefore that we abstain from all protestations! The difficulties with which many persons have to contend in the attainment of scientific knowledge are so great and multifarious as often to deter them from the prosecution of their inquiries; and whilst these obstacles go to the exclusion of all intellectual acquirement by men whose means are not sufficient to compass, but whose hearts still yearn after the expensive and elaborate works which generally contain it, they at the same time, in many a case, are a means of depriving the world of powers which, brought into fair exercise, might have been productive of honour and advantage to it and to themselves. For those, and for the purpose of placing this knowledge in an attainable shape, is our work chiefly intended, and to atchieve this object shall all our exertions be directed. We seek not to be wholly *original* so we be *useful;* and if we can gather the pleasant fruits of knowledge from the abundance of another source, we shall not reject them for the produce of our own more sterile soil.

We shall be sincerely happy to receive and to avail ourselves of the ideas of the mechanic and the artisan in whatever language they may be framed. We know their object, and shall easily discover their intrinsic value, however crude and indigested they may appear.

[*To be continued every* Fortnight.]

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REGISTER

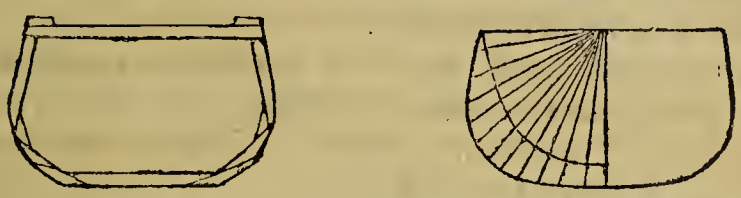
OF

THE ARTS AND SCIENCES,

IMPROVEMENTS & DISCOVERIES.

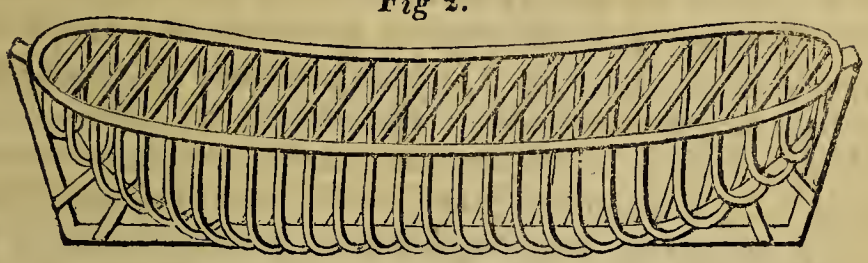
No. II.] SATURDAY, NOVEMBER 1, 1823. [Price 3*d.*

Fig. 1.



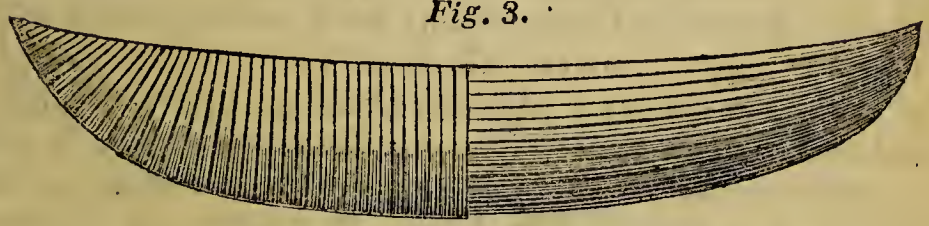
Centre Mould. Section of Model.

Fig 2.



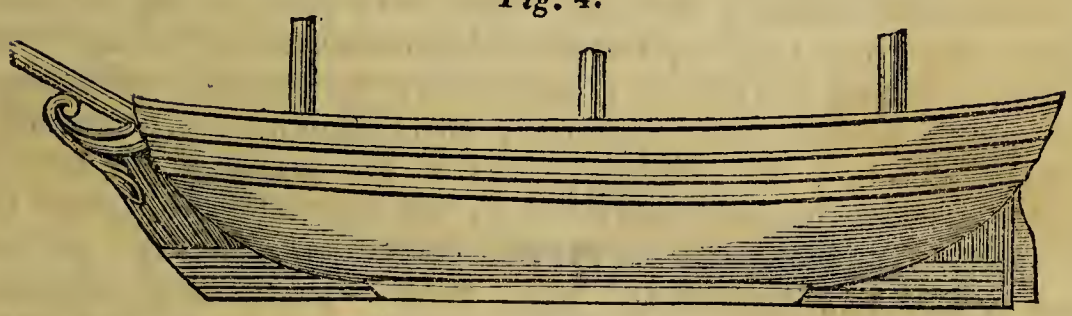
Perspective View of Moulds set up.

Fig. 3.



The alternate Courses of Fore and Aft and Cross Planking.

Fig. 4.



Profile of the Vessel complete.

THE NEW SYSTEM OF NAVAL ARCHITECTURE.

It has often appeared to us as an extraordinary fact, that for the last century little has been done in improving the system of Ship Building, and that nearly the same mode has been adopted from time immemorial. The Ancient Vessel, now exhibiting near Waterloo Bridge, on the Surrey side, is said to be nearly a thousand years old; and were she to be built on the general mode of the present day, the construction would be nearly the same. It therefore gives us pleasure

that we have obtained some information respecting Annesley and Sowerby's "Patent System of Ship Building."

It seems as if they had made the bold attempt to supersede, *altogether*, both the present and the ancient mode of building! Their vessels are finished where the others began, namely, by putting on the keel the last!

Our knowledge in nautical affairs is not entirely theoretical; and we cannot but feel convinced of the decided superiority of vessels built upon their system, as possessing greater strength, greater buoyancy, with many other important advantages, which we purpose to notice in a future number.

We have been favoured, with the annexed account of the manner of building, with some drawings, exhibiting the principal distinguishing features of the new system, and have had them engraved, to exemplify the subject to our readers.

"Their mode is, first to form a model to the fancy of the eye of those who are to be the proprietors, and regulate the symmetry accordingly: this done, it is cut across; and from very simple calculations the mould is formed, *Fig.* 1, which produces the exact fac-simile of the model to any size intended: the moulds are then set up on the building blocks, *Fig.* 2, much the same as the vessels on the old plan appear when in frame timbers; the moulds are of slender materials, merely strong enough to keep together the perfect shape of the intended vessel: a longitudinal layer or course of planks are then fastened to the moulds all round, namely, bottom, sides, and deck; sheets of tarred paper are then laid on, and a second course of planks are put upon the course athwart, all round the first course, *Fig.* 3, so that the grain of the timber is crossed, these are firmly treenailed together, and repeated alternately, till a sufficient substance is acquired for the strength of the vessel: the keel, stem, and stern posts, are put on with the last course, *Fig.* 4, and then the whole is treenailed through and through, each treenail being driven hard in, then split at the end and wedged; the dead wood, both fore and aft, is formed by cross planking, to fill up the space between the body of the vessel and the stem and stern posts; and to save the bottom, strengthen, and keep her upright when a-ground, two bildge keels are treenailed or bolted through into bildge planks in the inside of the vessel; stauncheons with brackets are fixed to the sides and deck, and the bulwarks are formed prior to the last course of planking: the last course is then laid to finish the deck; hatchways, opening, and companions, are then cut out of the solid deck, and the comyns introduced.

"This system requires less timber, no knees, no beams, no timbers, is more buoyant, much stronger, in case of war cannot have splinters from the effect of shot; no loss of time for seasoning the timber, no dry rot, the air and wet being excluded from all the inner courses; no straining, the resistance being equal, and the crossing the grain being the strongest way wood and wood can be put together: these vessels are almost invulnerable, having, in every position, a convex arch to resist outside shocks."

THE ANCIENT ART OF ENCAUSTIC PAINTING.

(Continued from Page 15.)

Yet, notwithstanding the ingenuity of this communication, we find the Ancient or some similar method of Painting in Wax, remained a desideratum upwards of twenty-five years; and till, in 1787, a method was communicated to the Society of Arts, by Miss Greenland. The ground of her information she received at Florence, through the acquaintance of an amateur of painting, who procured her the satisfaction of seeing some paintings in the ancient Grecian style, executed by Signora Parenti, a professor of that place, who had been instructed by a Jesuit, at Pavia, the person who made the farthest discoveries in that art. Miss Greenland's friend, knowing she was fond of painting, informed her what the materials were the paintress used, but could not tell her the proportions of the composition; however, from her anxiety to succeed in such an acquisition, she made various experiments, and at last obtained such a knowledge of the quantities of the different ingredients as to begin and finish a picture, which she afterwards presented to the Society for their inspection.

Her method is as follows:—"Take an ounce of white wax, and the same weight of gum mastich, powdered. Put the wax in a glazed earthen vessel, over a very slow fire; and when it is quite dissolved, strew in the mastich, a little at a time, stirring the wax continually, until the whole quantity of gum is perfectly melted and incorporated: then throw the paste into cold water, and when it it hard, take it out of the water, wipe it dry, and beat it in one of Mr. Wedgewood's mortars, observing to pound it first in a linen cloth, to absorb some drops of water that will remain in the paste, and prevent the possibility of reducing it to a powder, which must be so fine as to pass through a thick gauze. It should be pounded in a cold place, and but a little while at a time; as after long beating, the friction will in a degree soften the wax and the gum, and instead of their becoming a powder they will return to a paste.

"Make strong gum-arabic water; and when you paint, take a little of the powder, some colour, and mix them together with the gum-water. Light colours require but a small quantity of the powder, but more of it must be put in proportion to the body and darkness of the colours; and to black there should be almost as much of the powder as colour.

"Having mixed the colours, and no more than can be used before they get dry, paint with fair water, as is practised in painting with water colours, a ground on the wood being first painted of some proper colour, prepared iu the same manner as is described for the picture; walnut-tree and oak are the sorts of wood commonly made use of in Italy for this purpose. The painting should be very highly finished; otherwise, when varnished, the tints will not appear united.

"When the painting is quite dry, with rather a hard brush, passing it one way, varnish it with white wax, which is put into an earthern vessel, and kept melted over a very slow fire till the picture

is varnished, taking great care that the wax does not boil. Afterwards hold the picture before the fire, near enough to melt the wax, but not to make it run; and when the varnish is entirely cold and hard, rub it gently with a linen cloth. Should the varnish blister, warm the picture again, very slowly, and the bubbles will subside. When the picture is dirty, it need only be washed with cold water."

The opinion given by the Society upon the above is: The method made use of by Miss Greenland provides against all inconveniences; and the brilliancy of the colours in the picture painted by her, and exhibited to the Society, fully justifies the opinion, that the Art of Painting in Wax, as above described, highly merited the reward of a gold pallet voted to her on this occasion.

ELECTRICAL EELS.

The rivers and lakes of the lowlands of Venezuelas and Caraccas are full of Electrical Eels, called by the Spaniards Tremblador, (the Trembler), and by the French colonists of Guyanne, the Trembling Eels. These Eels have the astonishing faculty of striking their prey by a discharge of electrical matter. They are found also in the small ponds or pools interspersed in the vast plains lying between the Oronooko and the Apura. Travellers have been obliged to abandon the old route, by Urillica, on account of the danger incurred in passing through those stagnating waters, where the mules, struck on a sudden by an invisible commotion, were paralysed and drowned. The fisher, too, often received an electrical shock, to which his line served as a conductor.

The Electrical Eel is commonly about six feet long. The structure of its nervous system has been described with sufficient accuracy; but what has been said of its cellurary reservoirs, and the composition of its electrical batteries, is purely imaginary. The sensation occasioned by the shock is extremely painful; and in the parts affected it leaves a numbness: it resembles a sudden blow on the head, more than the commotion produced by the ordinary electrical fluid. The Indians have so great a terror of this animal, and such a repugnancy to come near it when living, that Mr. Humboldt had the greatest difficulty in procuring some of them for making experiments. For this purpose he staid several days near the Apura, in the small village of Calabozo, having learned that there was a great number of Electrical Eels near this river. His landlord made every effort to procure a number for him in vain. At length Mr. Humboldt resolved to go himself to the places which those Eels inhabit. Mr. Humboldt and his companions witnessed amidst the abodes of the Eels a sight altogether new and extraordinary. About thirty mules and horses had been hastily brought together from the neighbouring savannahs, where they live in a wild state in so great numbers, that the proprietor, when he is known, parts with them for about seven shillings each. The Indians surrounding the mules and horses, drove them into

the water, and prevented them from returning to land by means of harpoons, affixed to the end of long bamboos, which they pushed forward toward the animals, with loud vociferation. The Electrical Eels, or *Gymnoti,* roused by the noise and tumult, come up to the surface of the waters; and swimming, like so many livid serpents, glide under the bellies of the mules and horses, to whom they communicate commotions the most sudden and violent. The quadrupeds, in great agony, their hair standing on end, and their eyes rolling wildly with pain, make efforts for their escape in vain. In less than five minutes two of the horses were drawn under the water and drowned. Victory seemed to be declared on the side of the Electrical Eels; but their activity began to relax and languish: fatigued by the repeated efforts of their nervous energy, they launched the electrical fluid less frequently, and with less effect. The horses that had escaped destruction gradually recovered their strength; and in about a quarter of an hour the Eels retired from the combat, in such a state of languor and exhaustion, that they were easily drawn to land, by means of small harpoons attached to cords.—*See Humboldt's Travels.*

EXPERIMENTS ON THE RELATIVE STRENGTHS OF VARIOUS SUBSTANCES.

Mr. Rennie found the following weights requisite to crush a cubical inch of the undermentioned substances :

Elm,	1284. lbs.
White Deal,	1928.
English Oak,	3860.
Portland Stone,	620.
Craigleith Stone,	8688.

Cubes of a quarter of an inch, of different metals, were crushed by the following weights :

Cast Iron,	9775 lbs.
Cast Copper,	7320.
Fine Yellow Brass,	10306.
Wrought Copper,	6509.
Cast Tin,	966.
Cast Lead,	483.

Some curious calculations have been made by Mr. Dodd, the civil engineer, on the comparative tenacity of certain metals, in the pure and alloyed state. He says, " If I take copper, whose tenacity or strength on the square inch is 12 tons, 15 cwt. 1 qr. and 12 lbs., and to six parts of it add one of tin, whose tenacity is 1 ton, 19 cwt. 2 qrs. and 16lbs. finite reason would tell me I should weaken the copper 1 ton, 10 cwt. 3 qrs. and 7 $\frac{3}{7}$ lbs., instead of which, I add 11 tons, 15 cwt. 3 qrs. and 6 lbs. to its tenacity or strength, as experiment demonstrates; again, if I take three parts of tin, and add to it one of lead, the weakest of all metals, its tenacity or strength, on the square inch, being only able to carry 7 cwt, 2 qrs. and 20 lbs., mere

human reason, by mathematical calculation, would tell me, the two together would carry only 1 ton, 11 cwt. 2 qrs. and 17 lbs., instead of which, they will carry 4 tons, 11 cwt. and 8 lbs., which actual experiments demonstrate. How humiliating this to the knowledge of man, with all his chemical researches! How little does he know or comprehend of the secret workings of nature!"*

The cohesive force of metals is very much increased by hammering or rolling them. To draw asunder a cylindrical bar of iron, of 1½ inch diameter, requires a force of 43 tons; while a bar of only 1 inch diameter, and whose cubic admeasurement is not half as much as the 1½-inch, requires a force of 29 tons to draw it asunder; and if we take a wire of one-tenth of an inch diameter, which has been rolled and drawn so repeatedly, in reducing it to that size, we shall find that it will require a force of 650 lbs. to draw it asunder.

THE SHIELD OF ACHILLES,

By John Flaxman, R. A.

Happening the other day to stroll into the shop of the celebrated goldsmiths and jewellers, on Ludgate Hill, Messrs. Rundell and Bridge, among the many valuable and gorgeous articles by which we were surrounded, our admiration was singularly excited by a magnificent shield, which, although of silver gilt, and of large dimensions, and consequently very ponderous, was so nicely balanced on a massive and elegant stand, ingeniously constructed for the purpose, so as to admit of its being turned and examined. The shield, the circumference of which is no less than nine feet, and the convexity six inches from the plane, has been executed from drawings and a model, by Mr. Flaxman, which occupied that able sculptor, at different times, a series of years, and was finished in January, 1818. It is intended to represent the Shield forged by Vulcan, the artist of the skies, and presented by Thetis to her son, Achilles, to supply the place of that which he had lent his friend Patroclus.

Any description which we could give of the multifarious subjects introduced would be feeble and imperfect. We, however, observe, that the skill and application necessary to complete so extensive and complicated a composition, consisting of upwards of a hundred human figures, besides animals, &c. must have been very great. Nothing similar to it, ancient or modern, is, that we know of, in existence. Mr. Flaxman must, therefore, have relied on his own judgment and imagination, and we congratulate him on a happy opportunity thus afforded him, in condensing, in one comprehensive space, all the

* We think Mr. Dodd could not have been aware of the condensation that takes place by the mixture of these metals, the compound being thus rendered much more solid and compact. This may be proved by a very simple experiment. Take two cubic inches of copper and two cubic inches of pure tin, melt them, first the copper (to prevent much evaporation of the tin), then add the tin—the bulk of the compound will be found to measure not more than three cubic inches.

professional knowledge which he had acquired, during a long and laborious life, from the study of nature, and of the sculpture and literature of the Greeks. Amidst so much beauty and excellence, it is difficult to select any particular subject of admiration; if, however, we were absolutely required to do so, we should name the Personification of the Sun, by the spirited alto-relievo of Apollo in his chariot, in the centre of the Shield, and the manner in which the various subjects of War, the Attack by the Lions on the herd of Oxen, and the Marriage Festival are treated. Of the representation of War, especially, in which Mr. Flaxman's anatomical knowledge is displayed, it may with perfect truth be said, "that each bold figure seems to live or die." Nor in the attack upon the Herd can any thing be more admirable than the energetic ferocity of the monsters of the forest, who have fastened on the Bull; the desperate efforts of that noble animal to disengage himself, and the vain attempts of the Herdsmen to urge their fierce, but alarmed Dogs to further resistance. To these scenes of contest and death, the beauty, elegance, and sprightliness of the Nuptial Procession, with all its classical accompaniments, form a delightful contrast.

It appears, that highly to the credit of the taste, discernment, and liberality of Messrs. Rundell and Bridge, this has been entirely a speculation of their own. They gave the original order to Mr. Flaxman, and paid him for the drawings and the model, £620. Four casts of silver gilt, each of 2,000 guineas value, have been finished from it; the first for His Majesty, who, with his characteristic liberality and love for the arts, ordered a cast before the model was finished; the second for His Royal Highness the Duke of York; the third for the Earl of Lonsdale; and the fourth, which is the one we had the gratification of seeing, for the Duke of Northumberland. Each cast occupied two experienced workmen a whole twelvemonth. We are surprized that this elaborate and splendid specimen of English skill has not been announced for exhibition; and we are also convinced, that if an engraving of it was taken, the well-known taste of the British public would duly appreciate its merit, as it adds another wreath to English art and skill.

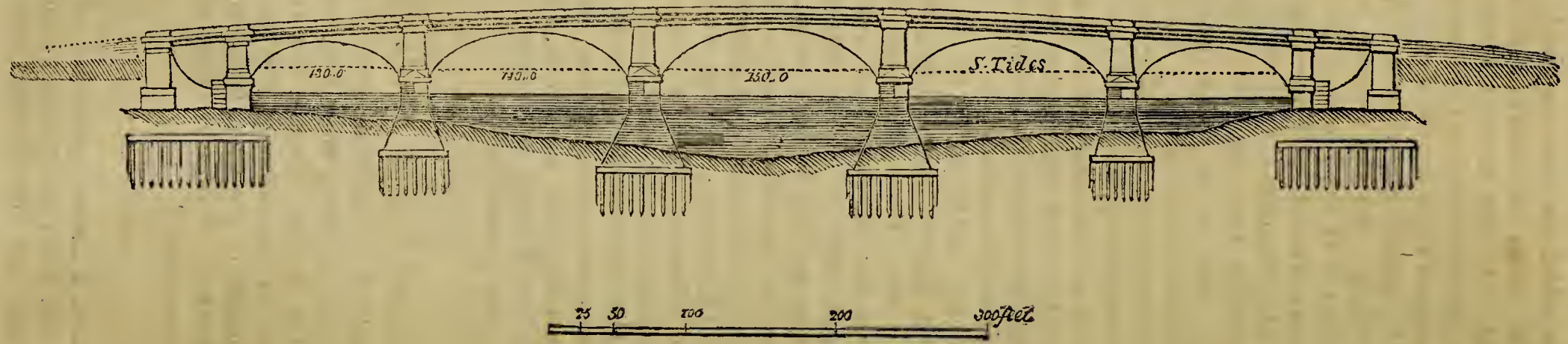
SUPERIOR BLUE DYE FROM THE IRIS.

"Professor Ormstead, of the University of North Carolina, has discovered that the petals of the garden Iris, or Blue Lily, gives a superior Dye to all the known blues. The tint is changed to a bright red by exposure to the carbonic acid gas, the same as turnsole. It is highly valuable to the dyer, from the richness and quantity of its colouring matter. Professor Ormstead will shortly make known the process he employs."

M. M. Capestolle, a French professor of chemistry, affirms, that a *rope of straw* will form an excellent conductor for lightning, and will supply the place of a metallic conductor.

NEW LONDON BRIDGE.—THE DESIGN DECIDED UPON.

We watched with much interest the proceedings of the London Bridge Committee, and hailed with pleasure the result of their deliberations. The necessity of removing the present Bridge, considered as a matter of mere safety and common prudence, appeared so positive and indispensible, that it needed little reasoning to enforce it. Indeed the hazard, the difficulties, and the danger with which it was fraught, and the accidents which were from time to time occurring, spoke with a voice which could not be misunderstood; and we viewed with feelings of real satisfaction, the wise course which, at



length, the Committee adopted, in determining on the destruction of the present pile of huge deformity, and of substituting in its stead a structure, at least something more secure. But there was yet another consideration that influenced our pleasure, which if not so powerful in a prudential point of view, was not the less weighty as a matter of art. Few there are, we imagine, who could find it in their politeness to compliment this first of cities upon the beauty or the elegance of the present Bridge. Comparisons, they say, are odious; but who that has skuttled through the waters of the Thames, has ever failed to draw them. Look at the splendid and magnificent design of the Waterloo; the bold, yet simple, conformation of the Southwark; and will any living being, as he sails beneath their arches, with scarcely an object around

him that speaks not of usefulness and beauty;—buildings towering their proud crests above; the very temples of science and of art:—can any human creature say that the "London Bridge" as now it stands, or rather totters, is not a living shame and a disgrace to the metropolis of the empire, and of the world?

It is our pleasure to prefix a copy of the elegant Design of the New Bridge; and in doing so we claim to say, that while it reflects honour to the architect, it does credit to the taste of those who made the selection. We have gathered together a few particulars, which we now will lay before our readers.

The present Bridge has now been standing 600 years. It has probably cost more for repairs, during the last century, than would have been sufficient to build half a dozen. The loss of life has been enormous;* and the destruction of property must also have been most considerable: common humanity, therefore, as well as common policy has, as we before stated, long rendered this undertaking one of absolute necessity. At the present moment every pier and starling is more or less seriously damaged. The immense quantities of stones that are annually thrown into the starlings, to fill up the chasms constantly formed by the rush of the waters, have only tended to increase the danger of the navigation, while it afforded but a temporary and frail security to the superstructure. The stones thus thrown in, owing to the enormous weight of water falling in cataracts over the starlings at ebb tide, and excavating, by its force, the bed of the river immediately beyond the fall, are constantly sinking, or are washed away, and thus leaves unsupported the piles of rubble, called starlings; which, therefore, sink by their pressure, and fill up, by degrees, the chasms formed by the falls. In point of fact, ingenuity seems to have been exercised but to render this Bridge absurd as a work of art, and unsound as a work of utility. The irregularity of the arches,—their various figures, and the unequal pressure to which they are subjected,—the great breadth of the piers, &c. &c. will, we think, without being unnecessarily harsh, fully warrant this supposition.

The New Bridge, (the erection of which will be commenced on immediately), is to be built on the western side of the present, and as near to it as may be practicable. The material with which it is to be constructed,—Scotch granite, is, we think, well chosen, and will render it as durable as it is beautiful. It is to consist of five elliptical arches; the central one of which to be 150 feet span between the piers: the two next to be 140 feet each: and the two adjoining the abutments 120 feet each. The height of the middle arch on the under side, above high water, at spring tide, will be 29 feet 6 inches; and from low water mark about 48 feet. The height of the roadway, or footpath, will consequently be about 10 feet higher; a sufficient elevation to view London, the Borough, together with the Surry Hills, to great advantage. This altitude will also enable a great

* It has been calculated, that upon an average no fewer than thirty-two persons have annually perished in consequence of the cataracts.

number of vessels, under 200 tons burthen, to pass under the Bridge by merely lowering their top-masts, which will be attended with manifest advantages. The ascent, on either side, to passengers and carriages over the Bridge, will not, however, be so steep as in the Old Bridge, in consequence of the curved line terminating at a greater distance from the river, and reaching, in all probability, from the top of Fish Street Hill to St. Margaret's Hill in the Borough. The houses on the western side of Fish Street Hill, and also on the western side of the narrow part of High Street, Borough, will consequently be to be taken down. The Old Bridge, provided it shall not be before swept away by the current, will remain for the public use, until the New one be completed; and we do not doubt that the advantages which must result to the public and to themselves, will most amply compensate the Committee for the depression it will occasion to the city purse.

BRITISH RAW SILK.

Some laudable attempts, attended with considerable success, have been made to rear the silk worm in this country. In the Transactions of the Society of Arts, Manufactures, &c. a variety of useful experiments are recorded with regard to the management and feeding of these insects. The common lettuce, of which we can easily raise any requisite quantity, affords excellent food for them, although the mulberry is preferable, and particularly the *white* mulberry. In the different experiments that have been made, it appears that the produce of the Silk was one-seventh more from worms fed upon the white mulberry than from lettuce. This difference is, however, fully compensated by the superior convenience of lettuce for feeding them. The climate of Britain, in many respects, possesses decided advantages over those of Italy and France. Owing to the superior heat of Italy, the chrysalis is re-animated very quickly, and begins to gnaw its way out, destroying the Silk in its progress; to prevent which, they are obliged to destroy the chrysalis before it returns to life, by placing them in heated ovens, by which process the Silk is frequently injured. This is, however, unnecessary in Britain, where the changes on the insect are so slow, that we are enabled to wind off the Silk without destroying the animal. A portion of the chrysalises they are under the necessity of preserving, to lay eggs for the succeeding stock, and these are obtained by permitting the moths to gnaw their way out of the cones, thus destroying all the Silk contained in them, which, in England, we should preserve by taking it off in good time. We have many species of worms besides the phalaena mori, or common silk worm, from which good Silk might be obtained. From all these considerations, we are disposed to believe, that if some of our ingenious and industrious countrymen were to take the matter in hand, we should soon see British Raw Silk equal in every respect to any from Italy, France, or Bengal.

A PERPETUAL SYPHON.

Professor Gazzeri, in Italy, has invented a new Syphon, which he calls perpetual; because it always possesses the faculty of making liquids pass from one vessel to another, even after the vessels are empty and the action ceases. This Syphon has two unequal arms; after entirely plunging it into any liquid, in order that it may be filled, and taking care that both orifices are constantly immersed, each extremity of the Syphon is introduced into a small vase or reservoir, filled with the same liquid, in which is plunged each end. Thus the immersion of the two ends is constant; and the entrance of the air and escape of the liquid, are equally prevented; the Syphon, always full, is in constant action, by only immersing one of its branches, without the aid of air, opening or shutting cocks, &c. What is remarkable in this invention, is the fact, that as soon as one vessel is empty it is filled again from the other; and so on continually.

THE ELEMENTS OF NATURAL PHILOSOPHY.

(Continued from Page 14.)

No. II.—Laws of Motion.

17. Every material substance or mass of matter is called a *Body;* and as the quantity of matter in a body is known by its particular weight or gravity, we are always to understand when a body is spoken of, the particular weight or gravity contained in it

18. Different bodies contain a different quantity of matter in different bulks or magnitudes; and a body that contains more matter than another under the same bulk is called *denser* than the other. So that if there be two balls of the same size and dimensions, one weighing two pounds, and the other four, the density of the latter is just double that of the former.

19. Motion is the continual change of place of any body.

20. *Rest* and *Motion* are of two kinds, *Relative* and *Absolute.*

A body may be relatively in motion, yet absolutely at rest, as a substance moving just as fast as the earth moves, but in the contrary direction.

It may also be relatively at rest, and absolutely in motion; as a body which is fixed to the earth and moves with it through space.

21. Velocity is the swiftness with which a body moves in a given time through a given space.

While this continues equal, the motion is called *Uniform*; when the velocity becomes greater, it is termed *accelerated motion;* when the motion decreases in force, it is called *retarded*

22. *Momentum* is the force with which a body in motion strikes or presses against any obstacle in its passage.

23. *Force* is the acting power upon a body which impresses a motion, and is either *retarding* or *accelerating*; this motive power

is also termed *Momentum,* and is formed by multiplying the weight or quantity of matter in the moving body by its velocity.

24. *Constant Forces* are those which act continually for a certain time.

25. *Variable Forces* are continually changing in their velocity and effect.

26. Gravity is that force by which bodies are carried downwards towards the earth.

27. *Specific Gravity* is the comparative weight of any body with respect to that of another body of equal magnitude; that is to say, when one body equal in size to another weighs more than that other it is said to be *specifically heavier.*

Density and specific gravity are in the same proportion.

28. All bodies are observed to move according to stated and never varying laws; and these laws, according to Sir Isaac Newton, are threefold, viz.

1. All bodies continue in their state of rest or motion if not disturbed by some external cause.
2. All motion or alteration of motion is always proportional to the force that is the cause thereof, and in the same direction in which that force is impressed.
3. Action is always equal and contrary to re-action; or the actions of two bodies upon each other are equal, and in contrary directions.

29. The first principle is termed the *vis inertiæ* of matter, or that tendency that all bodies have to remain still when not acted upon by some external impulse, and to continue in motion when impelled.

30. The second may be illustrated thus: if a certain force gives motion to a certain quantity of matter, with a certain degree of velocity, a double degree of force will double that degree of velocity.

31. And the third in this way: whatever tends to draw, to attract, or to press, is at the same moment attracted, pressed, and drawn, with an equal force.

DOMESTIC HINTS.

The conversion of starch, wood, and even rags into sugar, will no doubt, very much surprize persons unacquainted with chemical research, but nothing can be more true. The chemical constituents of these different substances differ but little. The abstraction of a small portion of the carbon and hydrogen from starch converts it into sugar. By digesting potatoes with dilute sulphuric acid for a day or two, at a temperature 212 Fahrenheit, afterwards removing the acid by chalk, and concentrating the strained liquor by evaporation, crystals of sugar will be obtained. Saussure produced 110 parts of sugar from 100 parts of starch, from which he concluded, that sugar was a peculiar compound of water and starch. Mr. Braconnot treated elm dust with sulphuric acid in the same manner, as the starch, neutralizing the acid with chalk, and obtained a liquor which became gummy on evaporation. By triturating linen rags in

a glass mortar with sulphuric acid, a similar gum is produced. If the gummy matter is boiled with dilute sulphuric acid, a crystallizable sugar is obtained. A pound weight of rags may thus be converted into 18 oz. of sugar !

PLATINUM LAMP.

Our great and indefatigable chemist, Sir H. Davy, has in the course of his important researches discovered a means of procuring permanent light without flame : he has taught that a Platina wire of sufficient fineness, and an inch, or an inch and a half long, which has been heated red hot, may be long preserved in this state over a vessel in which there is sulphuric ether, or alchohol, in a state of evaporation. Thus this incandescent wire may be employed as a cheap night lamp, or instead of flint and steel to light tinder.

The Lamp of Safety for Coal Mines, the splendid invention of Sir H. Davy, in our next.

THE AMERICAN WATER BURNER

Has lately been invented by Mr. Morcey, of New Hampshire. It is a rough blow-pipe; but is applicable in many cases in place of a furnace. Tar is intimately mixed with steam, and made to issue from a small jet, in the manner of an eolipile; and the stream of matter, being ignited, produces a flame of great size and intensity. It appears that the water is partly decomposed towards the middle of the jet, and that the heat is thus increased by increasing the quantity of active agents. But whatever the exact effect, the water is found to be useful in preventing the formation of smoke, and increasing the combustion.

An useful hint may perhaps be derived from this, in the construction of furnaces to destroy their own smoke.

AMERICAN TAR LAMP.

An American chemist has lately invented a lamp in which tar is burnt instead of oil. It consists of a fountain reservoir to supply and preserve a constant level, and a lamp which receives the fountain pipe at one end, and at the other a burner for the tar : this is merely a small cup placed on the axis of the lamp, and supplied with tar from the fountain. A draught tube is fixed in the lanthorn, or external part of the lamp, and air is admitted by a hole at the bottom. The current of air in passing through the lamp envelopes the burner and urges the flame, and the draught tube conveys off the smoke.

A PREVENTIVE OF CONTAGION.

A French Journal recommends sulphur as an effectual preventive against all kinds of contagion. It should, of course, be kept constantly about the person, and be occasionally renewed by a fresh piece.

THE NEW ZEALAND FLAX PLANT.

This plant, which was the cause of the first plantation of our convicts to Botany Bay, in 1787, is found to be an indigenous plant of the south of Ireland, growing there luxuriantly, a sample of which has been received in London.

MORCEAUX SCIENTIFIQUES.

It is not generally known that a method for making very beautiful tablets for black miniature profiles was discovered by Miss Greenland, by mixing some fine plaster of Paris, in powder, with cold water to the thickness of cream, and then pour it on glass; cut the plaster to the required size when it is just set, and when quite hardened it can be taken off. Nothing can of course be simpler than this process; but the tablets thus formed may be made available to many ingenious devices.

The mouldiness which takes place in ink, seeds, paste, and leather, is wholly destroyed by the simple application of two or three drops of any essential oil. The same effect is produced by cloves. Half a clove put into an inkstand will completely prevent the formation of mouldiness. Aromatic seeds, or strong perfumes, such as peppermint and bergamot, are equally effectual. Russia leather, which is perfumed with the tar of the birch-tree, is never liable to mouldiness; and gingerbread, and bread containing carraway seeds, is far less subject to it than plain bread.

BLEACHING.

The application of oxymuriatic acid to dyed linen cloth will very speedily discharge the different colours, there being very few which can resist the powerful action of this acid. This serves to exemplify the process of *Bleaching* coloured goods.

SYMPATHETIC INKS.

Write with a weak solution of sulphate of iron, when dry it will have become invisible; by passing over it a feather or camel-hair pencil dipped in tincture of galls, the writing will immediately become *black.* If, instead of tincture of galls, the prussiate of potash be used, the letters will be exhibited of a beautiful *blue.*

An iron mast and bowsprit, manufactured on speculation, are shortly expected at this yard, to be tried in one of our vessels. The terms on which Government consents to make the trial are said to be the adoption of the discovery if it answer, and indemnity for the cost, attending the trial, if it does not.—*Plymouth Journal.*

GOLD.

The ductility and malleability of Gold is so great, that its limits are unknown. The weight of a single grain of fine gold leaf will cover 57 square inches. Calculating the specific gravity of the metal with this admeasurement, we find, that 282,000 of these leaves put together would only be an inch thick. It is, nevertheless, evident, that gold is capable of much greater extension, as the gold beaters are obliged to alloy the gold with copper, to make it hard enough to pass *over* the irregularities in the skins, which would otherwise pass *round* them. It is likewise proved by the silver gilt wire used for lace-making, which is drawn from an ingot of silver, previously gilded. Calculating the length and circumference of the wire thus drawn, it is found that the weight of a grain of Gold thus employed, has spread itself over a surface of twelve times greater extent than is done by the gold beaters in making it into leaves; therefore, it follows, if the Gold could be formed into leaves, as thin as the covering upon the silver wire, that it would take 3,384,000 leaves to make an inch in thickness!

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce, 1823.

Prevention of Smoke.—To the person who shall invent, and produce to the Society, the best and easiest means, superior to any now before the public, of preventing the emission of dense smoke, from the chimneys of steam engines, breweries, and manufactories. *The Gold Medal, or Fifty Pounds.*

Certificates that the means proposed have been found to succeed in practice, to be produced to the Society on or before the first Tuesday in Feb. 1824.

Purification of Coal Gas.—To the person who shall discover the cheapest method of purifying the inflammable gas procured from coals, superior to any now in use *The Gold Vulcan Medal, or Thirty Guineas.*

A full account of the process, with certificates of its fully answering the intended purpose, to be produced to the Society on or before the second Tuesday in February 1824.

Rendering Leather Water-proof.—To the person who shall discover a method superior to any now in use, and of moderate price, of rendering leather water-proof, without injuring its texture or pliability. *The Silver Medal, or Fifteen Guineas.*

A full account of the process and of the ingredients employed, together with their proportions, attested by satisfactory certificates, as well as samples of the leather in its prepared and unprepared state, to be produced to the Society on or before the last Tuesday in February 1824.

Preserving Iron from Rust.—To the person who shall invent and discover to the Society, a cheap composition superior to any now in use, which shall effectually preserve wrought iron from rust. *The Gold Medal, or Fifty Guineas.*—A full description of the method of preparing the composition, with certificates that it has stood at least two years unimpaired, being exposed to the atmosphere during the whole time, to be produced to the Society with ten pounds weight of the composition, on or before the last Tuesday in January 1824.

Substitute for the Basis of White Paint.—To the person who shall produce to the Society the best substitute, superior to any hitherto known, for the basis of white paint, equally proper for the purpose, as the white lead now employed; such substitute not to be of a noxious quality, and to be afforded at a price not materially higher than that of white lead. *The Gold Medal, or One Hundred Guineas.* A quantity of the substitute, not less than 25lbs. weight, with an account of the process used in preparing it, and certi-

ficates that at least one hundred weight has been manufactured, to be produced to the Society on or before the first Tuesday in February 1824.

Etching.—For the best free etching in historical composition, from a picture of eminence, by persons under the age of twenty-five. The *Gold Isis Medal.*—For the next in merit, the *Silver Medal.*—For the best free etching of a landscape, from a picture of eminence, by persons under the age of twenty-five. The *Silver Medal.*—The next in merit, the *Silver Isis Medal.*

Organzine Silk.—To the person who shall invent and produce to the Society a method by which to organzine silk equal in quality to the Italian throw, at an expense of not more than two thirds of the current price of throwing. The *Gold Medal, or Fifty Guineas.*—The communication, with a full description of the process, and models or drawings of the apparatus employed, and samples of the produce, with certificates of the invention answering the required conditions, to be produced to the Society on or before the second Tuesday in March 1824.

LIST OF NEW PATENTS.

To James Surry, of Battersea, in the county of Surry, miller, for his invention of a new method for applying heat for the producing steam, and for various other purposes, whereby the expense of fuel will be lessened.—4th September. Two months.

To Bryan Donkin, of Great Surry Street, in the county of Surry, engineer, for his discovery, or invention of a means, or process, of destroying or removing the fibres from the thread, whether of cotton, silk, flax, or any other fibrous substance, composing the fabrics usually termed lace, net, or any other denomination of fabric, where holes or interstices are formed by such thread in any of the aforesaid fabrics.—11th September. Two months.

To Henny Constantine Jennings, of Devonshire Street, in the parish of St. Mary-le-bone, in the county of Middlesex, for his invention of an instrument to be affixed to the saddle-tree, by the application and use of which, inconvenience and distress to the horse may be avoided.—11th Sept. Six months.

TO CORRESPONDENTS.

We hoped to lay before our readers a further notice of the Portable Gas Lamp, but from a press of other matter we are compelled to delay it until our next.

Those from whom we have received such prompt assistance are, we know, too much interested in the diffusion of science to require our apology or our thanks.

To our friend R . . . we would say, that his suggestion shall assuredly be adopted.

The wishes of A. E. I. O. U. (what a congregation of vowels) are without the *why*; they are not altogether consonant with our own.

Viator's observations "On Light" are too dark and obscure for us.

X.'s article on "Rope-making" is not exactly in our line.

Although unnoticed, our other friends are still in view.

We shall be sincerely happy to receive and to avail ourselves of the ideas of the mechanic and the artisan in whatever language they may be framed. We know their object, and shall easily discover their intrinsic value, however crude and indigested they may appear.

[*To be continued every* Fortnight.]

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REGISTER

OF

THE ARTS AND SCIENCES,

IMPROVEMENTS & DISCOVERIES.

No. 3.] SATURDAY, NOVEMBER 15, 1823. [Price 3*d.*

INVALID BEDSTEAD.

MECHANICAL ingenuity has rarely been exercised, in domestic concerns, more beneficially than in the invention of the new "PATENT INVALID BEDSTEAD," by Mr. Rawlins, (of Penton Place, Pentonville), and we feel peculiar pleasure in giving increased publicity to so excellent a contrivance for relieving the pains and sufferings of humanity.

A Bedstead.
B Swing Frame, shewing the Head and Foot Frames raised.

C Rising Head Frame.
D Rising Foot Frame.
E Rising Foot Frame, shewing the elevation of the Knee Joint.
F Folding Side Frame.

The Patient lies on the mattress on the swing frame, which may rest on a mattress beneath; or if desirable to lie softer, on a bed: and for the convenience of performing the offices of nature with cleanliness and comfort, the swing frame is raised up, by turning the handles at the head and foot of the bedstead, (one, or both, as occasion may require), so as to admit a bed-pan to be placed beneath a circular hole in the mattress; the cushion, which fastens in underneath with a buckle and strap, having been previously removed: by raising the swing frame higher, the bed beneath can be shaken up without inconvenience to the patient.

In asthmatic and other complaints, where a difficulty of breathing is experienced, the rising head frame may be elevated, so as to give the utmost relief the nature of the disorder will admit of. As persons long confined to bed grow weary of lying long in one position, they may by this apparatus be shifted from one position to another with great facility by their attendants, and in some cases by themselves: if, for example, it is wished to raise the feet, the attendant raises the rising foot frame by the hand hole in the foot board; and the swing bracket fixed beneath, drops into the racks cut in each side of the swing frame, and supports it at the desired elevation: again, if the knees require to be raised, the frame is raised as shewn in the figure E, the ends of the frame dropping into the rack beforementioned: if it is wished to raise and support the body on one side, the folding frame being introduced between the mattress and the swing frame, and the upper leaf of it raised, the patient is quietly turned on his side, and supported in that position, by the bracket dropping into the racks cut in the lower leaf, as shewn in the figure F. In truth, there does not appear to be any position of the body requisite for ease, which this apparatus is not capable of giving, without exertion or inconvenience on the part of the patient, and with great facility to the attendants; and the mode of using it is so simple, as to be clearly understood by the commonest capacity.

This Bedstead is made somewhat longer than bedsteads usually are: the width varies from four feet to any dimensions. The curtain rods are fixed so as to admit of the curtains being drawn all round the bed, and to fold over each other; thereby preventing all partial draughts of air: and the joints of the Bedstead are so formed, that it can be taken to pieces or put together in a few minutes. Without the swing frame, which may be removed at pleasure, the Bedstead may be used as any other; and when complete, with all its apparatus, it far surpasses all other inventions of the kind that we have seen or heard of, by its superior accommodations to the invalid, and the facility with which they are afforded.

GORDON'S PORTABLE GAS LAMP.

An extraordinary press of matter in our last number compelled us to postpone the further account to which we pledged ourselves in the first, and we are now the more pleased at it, inasmuch as that circumstance enables us to recur, without wearying repetitions, to the subject of an attack *(attack par excellence)* which has been made in the last number of the London Journal of Arts and Sciences, upon that admirable invention.

It is not, however, the writer of this same attack whom we would reprove; this would be flogging the winds; the unhappy gentleman has proved himself by far too witless to excite a serious consideration; but it is upon the Editors of a respectable journal that we attach the blame, in unwisely lending themselves to the diffusion of quackery and twaddle on a scientific subject, without previously ascertaining in how far they might be disseminating erroneous notions, or prejudicing the interests of science. This, to be sure, is purely an affair of their own; and all whose good opinion is worth the having, will no doubt award to it that degree of praise or of censure which it shall be our province to shew that it deserves.

We made it our business to inform ourselves well upon the nature and the merits of the invention before we volunteered our so unqualified a meed of approbation. We referred to the patentee's own statements and observations as they appeared in the different journals of the day when first he made it known;* we went over his calculations, and we felt fully assured of the accuracy of his premises. To make "assurance doubly sure," however, we waited their practical results; we saw them, and we then most unequivocally declared our conviction of its merits.

To the writer of the 'Attack,' to "Prudentia," as an individual, we have not one syllable to say; he is too irresistibly humourous to make any body angry: we would as readily think of reasoning with that twin-sister of his own, who plunged herself into a well, chin deep, at the sight of a comet; or discuss a point of science with our friend pig Toby, of very sapient memory. It is not with the words we have to do, but with the work which gives them weight; the London Journal has made them its very own, and it shall go hard with us, if we do not prove its correspondent (who reproves us so superciliously, and affects so much knowledge of the subject), has not exhibited an utter contempt of all reason and common sense.

"Prudentia" commences his precious arguments by a preachment upon the "great elastic power which is inherent in Gas; that it is capable of being compressed in strong vessels, even into a hundredth part of its volume; and that these portable lamps are made to contain many times their natural bulk of Gas, &c." and that, "admitting the vessel to be well made and perfectly sound, which is not always the case, the elastic force of the Gas when the Lamp is charged

* Vid. Ed. Phil. Journal, No. 2, vol. i. for Oct. 1819. Repertory for May 1820, id. Oct. 1823.

continually pressing the vessel outwards with very considerable power, must in the course of time tend to strain its joints, and as this continued pressure may, *very probably*, stretch the vessel, may it not absolutely weaken the cohesion of the metal."

The Portable Gas Company, as we understand it, have positively pledged themselves to the public, that every one of these Lamps has been proved to resist a pressure of between 600 and 700lbs upon the cubic inch; and, that they will in no instance be subjected to a pressure of little more than 400; there will therefore be a surplus strength of 200 upon every square inch; or in other words, each vessel has sufficient power to receive a supply of Gas nearly equal to fifteen *additional atmospheres!* this, however, it seems is of no avail; for although the metal of the reservoir has been in the first instance proved to be capable of resisting the pressure of between forty and fifty atmospheres, yet this very same reservoir (mind you, gentle reader), is to be so strained by the pressure of thirty; the "elastic force" of the Gas (acquiring, according to "Prudentia," new urging powers with every succeeding moment), will be so continually augmenting, that "*as the pressure may very probably stretch the vessel, may it not absolutely weaken the cohesion of the metal?*" Excellently well, most redoubtable "Prudentia!" verily thy logic is subtle!

But, says Prudentia, "supposing a Portable Gas Lamp had been carefully proved, &c. while this Lamp was standing upon a table in the midst of a family, some accident overturned the Lamp, and threw it down upon the floor with some considerable force, the pressure from within would not permit a dent to be formed in the vessel, therefore, as a vibration must take place, some particles of the metal must give way, and, consequently, an explosion would take place, to the destruction of every person and thing within its reach!!!"

Let us suppose a possible case: suppose (at all times bearing in mind that "Gas is capable of being compressed even to a hundredth part of its volume") that from negligence or accident an indentation should be made in the vessel containing the Gas, what would be the result? would it tend to increase its condensation, or has it (to suit his purpose) lost all elasticity?—would not the very same property which allows of its indentation sufficiently guarantee permanent security?—would not the Gas, from its property of condensation, naturally and of necessity accommodate itself to the trifling diminution of the space which contains it? Let this cautious soul, let "Prudentia" put these questions to the first charity boy he meets, and if the urchin does not put him to the blush, consign him to the beadle for a thorough flagellation!

But we now come to what we consider to be by far the best thing in the letter. We have seen in our time great quantities of folly, much stupidity, and some raving, but never, we believe, since the days of Caxton has such arrant or egregious nonsense appeared in English print.

Behold, good people, a vessel filled to the very brim with Gas in a high and powerful state of condensation; this fluid is prevented from escaping by means of an air-tight valve, which of course receives

a pressure from within equal to the metal of the reservoir itself, and this pressure is of that enormous kind as to cause the direst apprehensions of danger; yet—(hear it not ye whirlwinds and tornadoes) yet—(distend your cheeks no more, oh Boreas!) yet, here is a gust of wind from the sudden opening of a door, to force down this same valve with all its powers of resistance, "*to drive the flame of the Gas-Lamp inwards, and then blow us all up!!*" Are our ears to be insulted by such trash as this? that a vessel, made of such sufficiency of strength as shall resist this enormous pressure, is to be bursted by the mere falling from a table on a carpet? is this science? this reason? this common sense? ought we then to be surprized to find this same writer making the amusing comparison between the oxy-hydrogen Blow Pipe of Dr. Clarke to a Portable Gas Lamp?—a wax taper to Mount Vesuvius!

In making these remarks we have nothing to do with "the persons calling themselves the Portable Gas Company;" we leave them to fight their own battles; our work is simply with the science of the thing. If they distribute defective vessels the affair is of course their own; and their wisdom, we should hope, is not of such a questionable kind as to induce them to risk their reputation and their money upon crazy and unsound materials; but we repeat again and again, that, arguing from the data which these "persons" have given, the consequences which are thus attempted to be drawn are physically and altogether impossible.

We should mention that we have made enquiry as to the bursting of a vessel alleged by Prudentia to have happened at the Gas Works, and find that he is equally unfortunate in this assertion as in all his others; nothing of the kind, we have been positively assured, has ever taken place there. We have, indeed, heard that one old woman and two cats were alarmed at the bursting of a reservoir in proving at the Gas Works at Old Ford; but this occurred eighteen months or two years ago, and long antecedently to the existence of the present Company.

We now take our leave of "Prudentia" and the London Journal; if we have been betrayed into any improper feeling upon the subject it must be attributed to its proper cause. We abhor and detest to see the columns of a scientific work made the vehicle of personal attack; we know nothing of either of the parties; but we do say, that never has there been, as it appears to us, a more vindictive attempt than this to throw discredit on a meritorious invention!

ASTRONOMY.

Theory of the Earth.—Professor Brande, in his excellent "Manual of Chemistry," notices the amusing theory of the earth as given by Buffon in his Histoire et Théorie de la Terre et des Epogues de la Nature. He says it merits attention, not on account of its accordance with present appearances, or as affording plausible solu-

tions of observed phenomena, but from the eloquence with which it is adorned, the extent of the information it displays, and the popularity it derived from these sources.

He supposes the planets in general to have been struck off from the sun by a comet; that they consisted of fluid matter, and thence assumed a spherical form; and that by the union of centrifugal and centripetal forces they are restrained in their present orbits. The earth gradually cooled, and the circumambient vapours condensed upon its surface, while sulphureous, saline, and other matters, penetrated its cracks and fissures, and formed veins of metallic and mineral products. The scorified or pumice-like surface of the earth, acted upon by water produced clay, mud, and loose soils, and the atmosphere was constituted of subtle effluvia, floating above all the more ponderous materials. Then the sun, and winds, and tides, and the earth's motion, and other causes, became effective in producing new changes. The waters were much elevated in the equatorial regions; and mud, gravel, and fragments, were transported thither from the poles: hence, says the speculator, the highest mountains lie between the tropics, the lowest towards the poles; and hence the infinity of islands which stud the tropical seas. The globe's surface, once even and regular, became now rough and irregular; excavations were formed in one part, and land was elevated in another; and during a period of ages the fragments of the original materials, the shells of various fish, and different other exuviæ, were ground up by the ocean, and produced calcareous strata, and other low-land depositions ! !

This, certainly, is doing business with a flourish of trumpets, and would seem to exhibit rather the poetic splendour of philosophy, than its dry details and deeply hidden truth.

FOSSILS.

Mineralized Tree.—About half a mile from the village of Chitteningo, in Sullivan county (New York), a Fossil or Mineralized Tree, was some years ago discovered. It lies at the base of the Conasewega mountains, within a few yards of a branch of the Erie canal, which runs up to the village. The tree appears to have been blown down, and broken off; there are eight or ten feet of the stump remaining, with some part of the large end near the root; the stump is about three feet in diameter; the bark—the fibrous texture of the wood—and two or three knots, are very obvious; there is a substance very much resembling veins disseminated through what seems to have once been the sap vessels of the tree, and from this circumstance, it is supposed to belong to the genus Pinus, although others have considered it a Juglans. The lower part of the root is imbedded in the soil where it probably once grew. Vast quantities of mineralized wood, both in small and large masses, are scattered in all directions round this stump. These fragments from their loose porous texture,

seem to have been petrified, after the wood began to decay. Indeed, so numerous are these fragments, that almost every stone in this vicinity appears to have been once a living plant.

A very fine specimen of the Elk, from the Isle of Man, has been presented to the Museum of the University of Edinburgh. It was dug up in the parish of Kirk-Balaff, and sent to the College by the Duke of Athol. It was found imbedded in loose shell marl, over which was a bed of sand, and over this a bed of peat, composed chiefly of small branches and decayed leaves, and over this was the common soil of the country.

	Ft.	In.
Height to the top of its horns, ...	9	7½
Length of the back to the end of the tail,	5	2
Breadth of the chest,.....	2	0½

MOVEABLE ROCKS,

Or masses of stone, so nicely balanced, as to be set in motion by a very small force, have excited the attention of both ancient and modern writers. In the town of Durham, New Hampshire, U. S. is a rock, computed to weigh sixty or seventy tons. It lies so exactly poised on another rock, as to be easily moved with one finger. It is on the top of a hill, and appears to be natural. In Phillip's-town, Putnam county, New York, is another, situated near the summit of a very high hill. The above engraving, from a rough sketch by Professor Green, is a correct representation of it; the circumference of this stone is about 31 feet, and five feet through in the thickest part, supported on a base or pedestal of about 18 inches in height, which is almost flat on its upper surface.—*American Journal.*

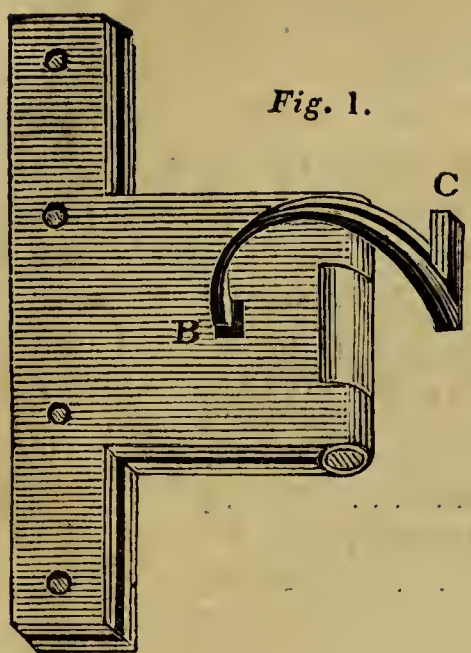

Fig. 1.

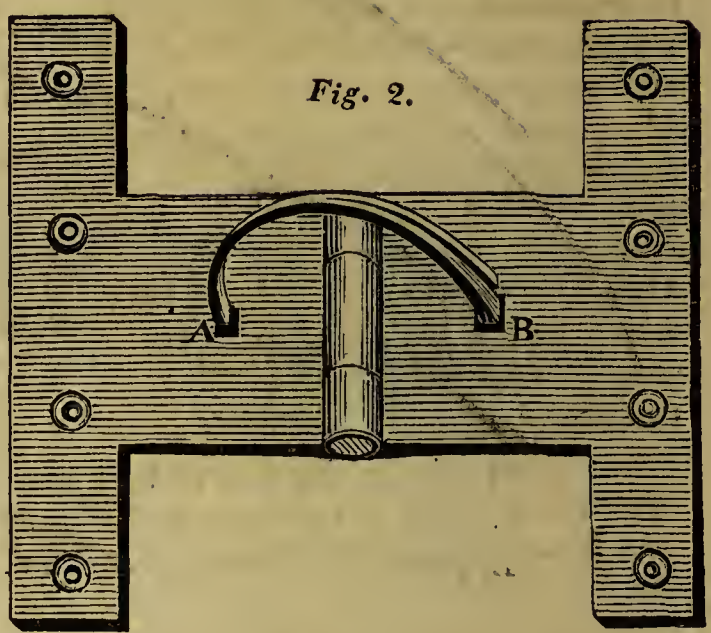

Fig. 2.

IMPROVED SHUTTER HINGE AND FASTENING.

We have been favoured with an inspection of this excellent contrivance, and are so much pleased with its simplicity, and so satisfied of its usefulness, that we have thought it our duty to make the invention more generally known, through the medium of our little work; the pages of which will be always open to the description of every improvement likely to become of public utility. Trifling as this invention may appear to some persons at first sight, we feel assured, the advantages which it confers will be duly appreciated by house builders, house owners, and indeed every body who have outside shutters to their windows.

The mode by which outside shutters are generally fastened back to the wall, is, by what is called a turnbuckle, an article too well known to need description. These turnbuckles being driven into the mortar between the bricks, are constantly becoming loose and unserviceable, or are drawn out and lost; the consequences of which, in windy weather, are, frequently broken shutters, and sometimes broken windows; besides the inconvenience to passengers, when they are situated in the street, of having projecting shutters intercepting their progress, or of having them dashed in their faces by sudden gusts of wind; to which may be added, the frequent tearing of clothes, particularly the flowing dresses of women, by the turnbuckles. These evils are, however, not all; the worst is yet to be stated. Instances have occurred, some fatal, in which persons, either from feebleness, or the want of due caution in reaching out of windows to fasten the shutters, having lost their balance, or their feet slipping, have been precipitated out of them to the destruction of their lives!

As appears in our engraving, the Hinge is in all respects the same as the common hinges, called parliament hinges, and the improvement consists in an addition to it, which, at the same time that it forms a

secure self-acting fastening, gives additional stability and durability to the Hinge, by removing a portion of the strain occasioned by the weight of the shutter from off the joint. *Fig.* 1. represents the Hinge, and, consequently, the shutter when attached to it, as shut; a strong square piece of iron is worked into a semicircular form or arch, which passing through the hole at B, is firmly rivetted into the opposite flap of the Hinge, as seen at A, *Fig.* 2; the other end of this arch is turned up to form a stop, as seen at C, *Fig.* 1. Upon opening the Hinge, or shutter, the flap marked B passes over the arch, pressing on the spring which forms a part of it, as seen in both figures, and when arrived at the stop C, *Fig.* 1, the hinge is completely opened (as shewn *Fig.* 2,) and the shutter is fastened securely against the wall by the spring opening again, and preventing it from returning. When it is required to shut the shutter, a slight pressure with a finger on the spring is sufficient to allow it to return, notwithstanding which, the spring is so strong that no force applied to the shutter can overcome it. It is formed of one piece with the arch, which is split to half its length to form the spring, the spring being one third the thickness of the whole. The excellence of every invention mainly consists, in its *simplicity, utility,* and *cheapness.* The extreme *simplicity* of this invention is manifest. Of its *utility* we think no one can doubt; to us it appears to be a perfect cure for all the inconveniences attendant upon the present mode of fastening outside shutters. With this new Hinge a shutter need only be opened to be strongly fastened back; and to shut it, not even the whole of the hand need be extended out of the window, the fastening being fixed close to the sash, in the window frames. Lastly, as to its quality of *cheapness:* the expence is only about sixpence per pair more than common hinges, being about the cost of the inconvenient turn buckle, no longer requisite.

We are informed that Messrs. Wright and Andrews, of West Smithfield, have the exclusive sale of this article, and that it is in contemplation to obtain a patent.

CURIOUS WORKS OF ART, &c.

Antiquities.—Near Brownsville, a town on the Monongahila, in the western part of Pennsylvania, in clearing the ground, there has been discovered a sand stone work about 16 feet square; on its surface are carved several figures, among which are two of the human form, a man and a woman, with a tree between them, and a variety of animals. The oak that covered it was at least 500 years old; consequently these figures must have been carved before the discovery of America by Columbus. Similar discoveries have likewise been made in various parts of the United States. In the countries about the Ohio several hills have been discovered, which are, certainly, the work of human hands, and must have required the labour of thou-

sands. "One of these," says a late traveller, on a journey through them, "I saw, whose perpendicular height was 75, the circumference at the base 540, and at the summit 120 feet. On the summits grow large oaks, apparently from 400 to 600 years old. Near the mouth of the Muskingams, 183 miles below Pittsburg, there is an ancient fortification, occupying about 40 acres of grounnd; round it are several longish quadrangles of 140 to 200 feet in length, surrounded with ramparts from 10 to 30 feet in height; on which, also, are very old trees. On each side are three openings, at equal distances; the middle one 30 feet high and 22 feet wide. The whole is surrounded by a mound of earth, the base of which is 40 feet, and its height 10 feet. The oldest Indians say they existed at the arrival of their forefathers, and many utensils have been found in a petrified state, which indicates a degree of civilization unknown in any of the Indian nations."

In the Palatine Hill, at Rome, (so fraught with rich monuments of antiquity) there has been discovered, in an antique chamber, a statue of Minerva, about five or six palms below the surface of the earth, in a vineyard belonging to the English College, but deficient of a head and right hand; the rest of the statue is in fine preservation, and proves to be of exquisite workmanship. The drapery covers the left hand with which it is enfolded. An ægis, studded with stars, and bordered all round with snakes, decorates the breast. It is at present in the English College.

Tapestry woven in a Carpet Loom.—We are indebted to the politeness of Mr. Bowyer for the sight (at his warehouse, in St. Mildred's Court, Poultry), of a novel and curious kind of Carpet, which in effect is very similar to tapestry; and which will probably, in the course of a few years, entirely supersede those laboured productions. The subject is Rubens's celebrated picture of Christ being taken down from the Cross, and measures about 20 feet by 14. This size, admitting the figures to be as large as life, the effect is very striking. The colours are rich and beautiful; and the draperies of the different individuals, composing the group about the cross, have an imposing reality about them which it would be difficult to excel. We were informed by Mr. Bowyer that every part of it was woven in a common carpet loom in the usual breadths, and that the weaver had merely for his guide a small coloured copy of the picture: the tasteful blending of the colours, the justness of the shadows, and the correctness of the outlines depending upon his skill and ingenuity. Owing to the coarse threads of which carpets are formed, and their crossing one another at right angles, the outlines of the features of the faces have unavoidably a somewhat harsh and jagged appearance, which can of course be easily corrected by the use of the needle. Mr. Bowyer would not permit this to be done, being desirous to exhibit only the production of the loom.

Another carpet similar to this has been made by Mr. Bowyer at

Kidderminster, and the subject being so suitable, it now adorns the altar-piece of the church of that town.

Dr. Oliver says, " that in Holland, an English gentleman once showed him a cherry-stone with a hundred and twenty four heads upon it, and all so perfect, that the naked eye might distinguish those of kings, popes, cardinals, &c. by their crowns and mitres. This curiosity was bought in Prussia for three hundred pounds, and is said to have been the workmanship of a poor wretch in prison at Dantzick.

MEDICINE.

Remedy for Hæmorrhage.—Mr. J. H. Lindsay, of Stratford, U. S. has found that the hycopus virginicus, commonly called the bugle weed, to be almost a sovereign remedy for internal hæmorrhages. In consequence of a publication by Mr. L. about two years ago in the Connecticut Herald, about 20 persons afflicted with hoemoptisis were restored to health by the use of this weed. The months of August and September, are the proper times to collect the plant, during which period it is generally in flower. Another common name for this plant is water horehound; it is a very common weed, and grows mostly in low, wet, and marshy lands.

Iodine as a Medicine.—Dr. Coindet has been employing Iodine in the treatment of goitres and scrophula, with a success surpassing his most sanguine hopes. It is introduced into the system by means of rubbing, in the same manner as other mineral ointments. Out of twenty-two patients, who had all very large goitres—half of them were completely cured in the space of from four to six weeks, and the others in a greater or less degree.

CHEMISTRY.

Ink.—It has often been to us a matter of great surprise, that the subject of Inks should have excited so little general attention. When we consider its mighty agency in the affairs of commerce, and those comparatively still more important, of law, we have frequently been astonished that the persons who are so more immediately concerned with its operation, should quietly put faith in the perfectability of compositions, the real value of which they have no means, or at least no desire, of ascertaining. The consequences in innumerable instances have been, that chemistry has supplied its powers to the purposes of villany, and the innocent and unsuspecting have become irretrievably ruined, for the want of a little common prudence and foresight on the part of those whose duty it was to have guarded

against so possible a danger. When scarcely a week intervenes which does not disclose the disastrous consequences incident to this shameful negligence, we do repeat that it becomes the imperative duty of every one in whom confidence has been reposed, or power given, to see to the formation of so powerful an instrument, and give to it that degree of consideration or personal inspection which it so greatly requires.

The most important object in the making of Ink, is to employ those substances which shall be indestructible by the application of any process that will not at the same time destroy the material upon which it shall be used.* For this purpose Mr. Close has recommended 25 grains of copal, in powder, dissolved in 200 grains of oil of lavender, by the assistance of a gentle heat, and then mixed with 2½ grains of lamp black, and half a grain of indigo; or 120 grains of oil of lavender, 17 grains of copal, and 60 grains of vermilliou. A little oil of lavender or of turpentine may be added if the Ink be found too thick. Mr. Sheldrake indeed suggests, that a mixture of genuine asphaltum dissolved in oil of turpentine, amber varnish, and lamp black, would be even superior to this. †

Combination of Hydrogen with Oxygen, at a common Temperature.—M. Doebereiner, of the University of Jena, has recently discovered that platinum, in a spongy or divided state, possesses the curious property of causing the combination of hydrogen with oxygen, at the temperature of 100° Fahrenheit; and that the developement of heat resulting from this action renders the metal incandescent. Messrs. Dulong and Thenard, of the French Academy of Sciences, have verified this extraordinary fact by a series of experiments, which are detailed in the Annales de Chimie, vol. 23.

This newly-discovered property, which is so likely to lead to very important results, has engaged the attention of our own chemists; particularly Mr. William Herapath, who appears to have investigated the subject with admirable perseverance and ingenuity. From these experiments Mr. Herapath says, "I am warranted perhaps in concluding,—First, that no chemical change takes place in the platinum, and therefore I conceive its effect to be mechanical. Second, that a change does take place in the condition of the gases, which change is their union to form water. Third, that in case the gases have the temperature of 55° the platinum requires a temperature of

* When writing with common ink has been effaced by the agency of aqueous clorine, the vapour of sulphuret of ammonia, or the immersion in water which has been impregnated with this sulphuret will render it again legible. Or if the paper that contained the writing be put into a weak solution of prussiate of potash, and when it is thoroughly wet, a little sulphuric acid be added to the liquor so as to render it slightly acidulous, the same purpose will be answered.—*Ure.*

† Ink-making is considered a very respectable employment in China: it is even ranked among the liberal arts on account of its utility to the sciences. In a city famous for the finest ink, ink-makers have several small apartments illuminated night and day.

98° to cause them to unite. Fourth, that as the condensation of the gases is the only change in the substances used, we must infer that the greatly increased heat of the platinum arises from the condensation."

Mr. Herapath continues, "I have here pointed out the proximate cause of the heat of the platinum, but the ultimate I have not been able to discover. It is therefore left as a problem to future enquirers, why platinum in a state of minute division should cause the union of oxygen and hydrogen at 100°, whereas, the lowest combining temperature without it is 700°?"

Professor Doebereiner has already applied his discovery to the formation of a new apparatus for procuring fire, and of a new lamp; and he says, that he shall avail himself of it for much more important purposes.

SMELTING SILVER.—A mode has been discovered of smelting Silver, (even if in granite formation) possessing the following advantages. The use of quicksilver and alkalis is dispensed with. The separation is formed in three hours; without roasting, calcining, pounding, or any previous preparation. It yields about 20 or 21 carats fine. The crystals are reduced to a metalline form, which by the amalgation mode is carried off with the earthy particles. The small quantity of fuel and flux required by this mode. When the flux by which this is achieved is used for copper ores, they seldom require more than once melting, and are fit for use. *Phil. Mag.*

COLOUR PRODUCED IN PLATE GLASS BY THE SUN'S RAYS.—"It is well known," Mr. Faraday remarks, "that certain pieces of Plate Glass acquire by degrees a purple tinge, and ultimately become of a comparatively deep colour. The change is known to be gradual, but yet so rapid, as easily to be observed in the course of two or three years. Much of the Plate Glass which was put a few years back into some of the houses in Bridge Street, Blackfriars, though at first colourless, has now acquired a violet or purple colour. Wishing to ascertain whether the sun's rays had any influence in producing this change, the following experiment was made. Three pieces of Plate Glass were selected, which were judged capable of exhibiting this change; one of them was of a slight violet tint, the other two purple or pinkish, but the tint scarcely perceptible except by looking at the edges. They were each broken into two pieces; three of the pieces were then wrapped up in paper and set aside in a dark place, and the corresponding pieces were exposed to air and sunshine. This was done in January last, and the middle of this month (September) they were examined. The pieces that were put away from light seemed to have undergone no change; those that were exposed to the sunbeams had increased in colour considerably; the two paler the most, and that to such a degree, that it hardly would have been supposed they had once formed part of the same pieces of glass as those which had been set aside. Thus it appears that the sun's rays

can exert chemical powers even on such a compact body and permanent compound as glass."

MNEMONICKS.

Mnémonique.—The art of assisting the Memory was much thought of by the ancients; and again seems to attract the attention of the moderns. At a recent lecture delivered by M. F. Côme at Paris, he proved that what appeared an impossibility for the power of memory to retain, could be easily acquired. In confirmation of which he answered to the chefs d'œuvres of Racine, consisting of 15,000 verses; thus, when asked which was the 300th or 654th verse of Athalie, Andromaque, Brittannicus, &c. he immediately recited it; and on any verse being read to him, he gave its number without hesitation or failure. Among the auditory were Professors Portez and Andrieux, of the French College; who after having addressed various questions to M. Côme, declared themselves highly in favour of the art. M. F. Côme intends giving a series of lectures on his Art of Artificial Memory.

DOMESTIC ECONOMY.

Preserving of Eggs and Potatoes.—The Scotch method of preserving Eggs, by dipping them in boiling water, (which destroys the living principle), is too well known to need further notice. The preservation of Potatoes, by similar treatment, is also a valuable and useful discovery. Large quantities may be cured at once, by putting them into a basket as large as the vessel containing the boiling water will admit, and then just dipping them a minute, *or two at the utmost.* The germ, which is so near to the skin, is thus "killed," without injuring the Potatoe.—In this way several tons might be cured in a few hours. They should be then dried in a warm oven, and laid up in sacks or casks, secure from the frost, in a dry place. Another method of preserving this valuable root is, first to peel them, then to grate them down into a pulp, which is put into coarse cloths, and the water squeezed out by putting them into a common press, by which means they are formed into flat cakes. These cakes are to be well dried—and preserved for use as required. This is an excellent and ingenious mode of preserving Potatoes; although attended with too much trouble on the large scale.

It is said that a piece of lime put into the water in which Potatoes are boiling, will render the heaviest light and floury.

Rural Economy.—An experienced farmer, of the Netherlands, assures us that an ounce of saltpetre dissolved in a pint of water, with an ounce of flower of sulphur, and scattered upon grain in a granary, is an infallible means of preventing it from spoiling.

Milk.—Kirchoff, the Russian chemist, who discovered the process of converting starch into sugar, has made several experiments on Milk; by which it appears that that fluid may be preserved for use for an indefinite time. Fresh Milk is slowly evaporated by a very gentle heat, till it is reduced to a dry powder—which is to be kept perfectly dry, in a bottle well stopped, for use. When required, it need only be diluted with a sufficient quantity of water; the mixture will then have all the taste and properties of new Milk. This powder must form a valuable addition to a sea stock of provisions.

Notices of New Publications.

The following Works are now in the press, and will shortly be published.

An Introduction to the Anatomy of the Human Body for the Use of Painters; from the German of J. H. Lavater, illustrated by 27 Lithographic Plates, 1 vol. 8vo.

A Geognostical Essay on the Superposition of Rocks in both Hemispheres, by M. de Humboldt: translated into English under his immediate Inspection, 1 vol. 8vo.

An Introduction to Entomology, or Elements of the Natural History of Insects, by W. Kirby, M. A. F. R. & L S. and W. Spence, Esq. F. L. S. illustrated by coloured plates, vols. 3 & 4, 8vo. which complete the work.

Works recently published.

A Treatise on Subterraneous Surveying, and the Variation of the Magnetic Needle. By Thomas Fenwick, 2d edit. 8vo. with plates, 12s.

Supplement to the comparative Estimate of the Mineral and Mosaical Geologies: relating chiefly to the Geological Indications of the Phenomena of the Cave at Kirkdale. By the Author of the Comparative Estimate, &c. 8vo. 5s.

Medical Jurisprudence; comprehending medical, chemical, anatomical, and surgical Investigations, applicable to forensic Practice; for the Instruction and Guidance of Coroners, Magistrates, Barristers, Medical Witnesses, &c. By John Ayrton Paris, M. D. F. R. S. F. L. S.

An Elementary Treatise on Algebra, theoretical and practical. By J. R. Young.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce, 1823.

Oil for Chronometers.—To the person who shall invent and discover to the Society, a method verified by actual experiment of rendering oil more fit than any now in use for chronometers and watches particularly, and less liable to become thick and rancid. *The Gold Medal, or Fifty Guineas.*—A full account of the process or processes employed, verified by satisfactory certificates, together with a specimen of the oil to be produced to the Society on or before the last Tuesday in March 1824.

Printer's Ink.—To the person who shall invent and discover to the Society the best composition for Printer's Ink superior to any hitherto known or in use. *The Gold Medal, or Thirty Guineas.*

Preventing the Dry Rot in Timber.—To the person who shall discover to the Society a certain method of preventing the dry rot in timber superior to any hitherto known. *The Gold Medal, or Thirty Guineas.*—The particulars of the method of prevention confirmed by repeated experiments to be produced to the Society on or before the last Tuesday in February 1824.

Dying Silk of a Pink or Rose Colour.—To the person who shall invent and discover to the Society a process of dying rose and pink colours in silk, without the use of safflower, by a substitute of British or colonial growth,

which shall produce a colour equally beautiful and permanent, and at an expense not more than two thirds of the current price. *The Gold Medal, or Thirty Guineas.*—The communication, with a full account of the processes employed, and the certificates that the required conditions are accomplished, to be produced to the Society on or before the last Tuesday in March 1824.

Lithography.—For the best specimen. *The Silver Medal.*—A particular account of the process employed, with six impressions of the drawing to be produced to the Society. For the best method of transferring Drawings from the Paper to the Stone, for the purpose of Lithography, superior to any now in use. *The Silver Medal, or Twenty Guineas.*—A complete account of the process employed, with specimens of the materials to be produced to the Society, on or before the first Tuesday in March 1824. Two specimens of the impression to remain with the Society.

Original Screw.—To the person who shall invent and make known to the Society any mode of producing an original screw more perfect than any hitherto known. *The Gold Medal, or Thirty Guineas.*—A model, or complete drawing and description of the method, with a screw not less than twelve inches in length, to be produced to the Society on or before the last Tuesday in February 1824.

TO CORRESPONDENTS.

H. R. appears to have put an improper construction upon our language. We never intended to assert that Mr. Gordon was literally the first person who ever conceived the idea of bringing Gas into a high state of condensation; but that he was the first who ever thought of making inflammable Gas under so high a state of condensation available for the purposes of illumination.

We are compelled to defer to our next a continuation of the articles on Natural Philosophy.

Our other Correspondents must stand over.

It would be as much opposed to our interests as to our inclination in the commencement of this work, to make pledges which it would not be in our power or our purpose to redeem; or to chalk out to ourselves a course of conduct which we never seriously intended to follow. It is therefore that we abstain from all protestations! The difficulties with which many persons have to contend in the attainment of scientific knowledge are so great and multifarious as often to deter them from the prosecution of their inquiries; and whilst these obstacles go to the exclusion of all intellectual acquirement by men whose means are not sufficient to compass, but whose hearts still yearn after the expensive and elaborate works which generally contain it, they at the same time, in many a case, are a means of depriving the world of powers which, brought into fair exercise, might have been productive of honour and advantage to it and to themselves. For those, and for the purpose of placing this knowledge in an attainable shape, is our work chiefly intended, and to atchieve this object shall all our exertions be directed. We seek not to be wholly *original* so we be *useful;* and if we can gather the pleasant fruits of knowledge from the abundance of another source, we shall not reject them for the produce of our own more sterile soil.

We shall be sincerely happy to receive and to avail ourselves of the ideas of the mechanic and the artisan in whatever language they may be framed. We know their object, and shall easily discover their intrinsic value, however crude and indigested they may appear.

[*To be continued every* Fortnight.]

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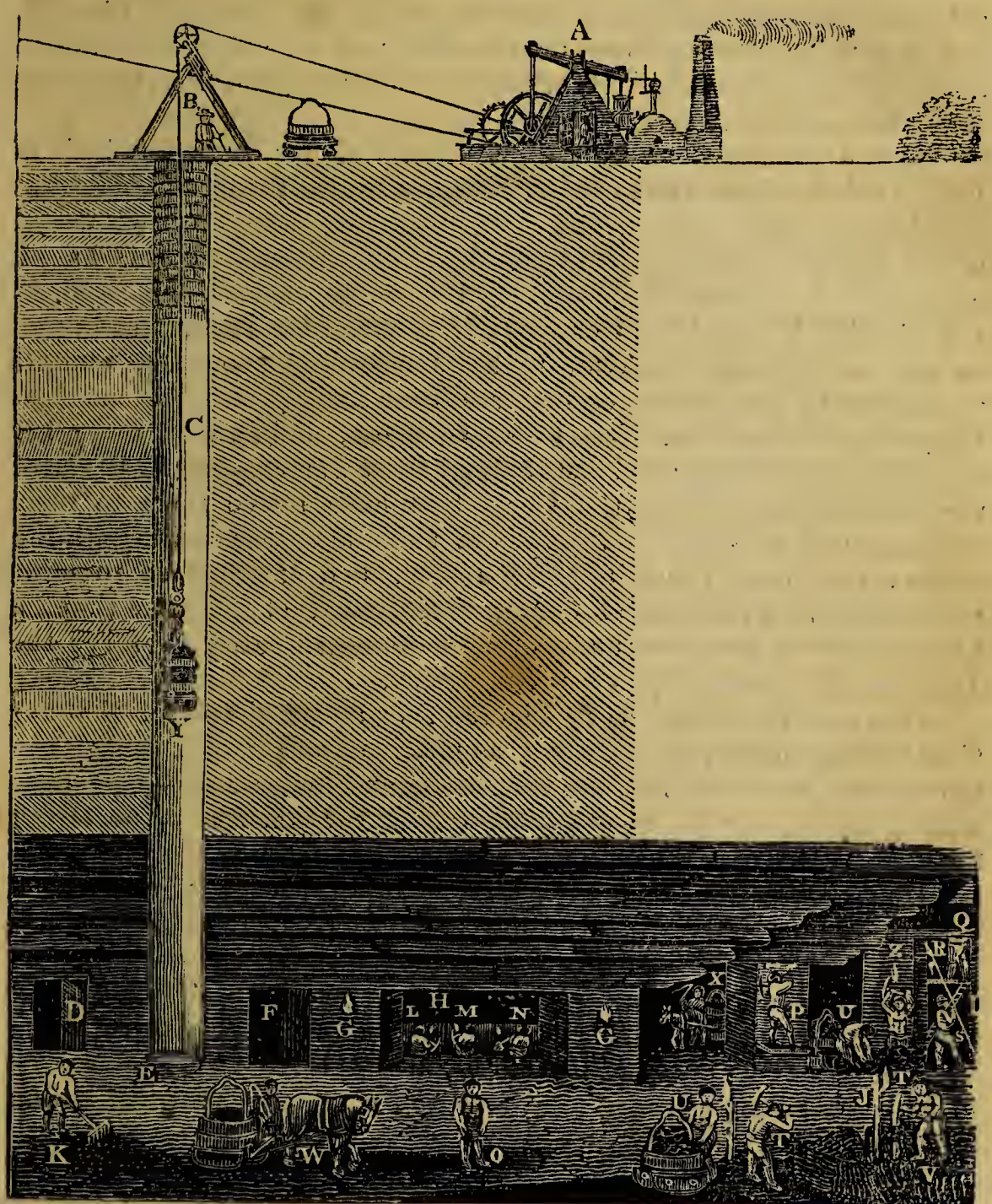

A SECTION OF BRADLEY COAL MINE,

NEAR BILSTON, STAFFORDSHIRE.

Our mines of Coal have been the source of greater wealth to England and Scotland, than all the boasted gold mines of Peru, Mexico, and Brazil, have ever been to either Spain or Portugal. Coals are found in almost every part of the world; but in no country

in such profusion, or of so good a quality, as in Great Britain, and to this circumstance we may mainly attribute our present greatness and prosperity; our superiority in almost every manufacture; our rapid and unparalleled advancement in most of the arts and sciences; and consequent refinement in our manners and habits. In coal mining, and in the carrying trade, a vast portion* of our industrious fellow-countrymen are employed, profitably to themselves, and usefully to the state; besides many hundreds of thousands of tons of shipping constantly engaged in transporting this valuable mineral, not only to all parts of our own coasts, and up our rivers, but to almost every port of the Netherlands, France, Spain, Portugal, the West Indies, and America.

Notwithstanding the prodigious extent of our numerous beds of coal, such has been the bounty of Nature to this favoured land, that we almost invariably find with it, in alternate strata, the most useful of all metals, Iron, in immeasurable abundance. By this happy combination of mineral products, the value of each of them is redoubled. Without the Coals our Iron would have remained buried in the earth;—Birmingham, with its magnificent streets, and its thousands of manufactories had not been built;—Wolverhampton, Sheffield, Whitehaven, Newcastle, Glasgow, and Bristol, and other great towns or cities would still have been wastes, or the fields of the husbandman. It is the Coals that have raised them to their opulence and splendour. Myriads of ships have been built with the forests that once grew in those towns, and transported to other nations the rich produce of our own; forming, at the same time, a nursery for an immense body of able seamen—ready to serve the cause of the country upon any emergency.

It is not, therefore, as fuel merely, or as merchandize, that our Coal Mines are so valuable; but as affording us peculiar facilities in our various manufactures, the surpassing excellence and cheapness of which, have given to us the monopoly of the markets of nearly all the world. We may, indeed, fairly consider our Iron as the produce of our Coal; the latter being necessary, (in a commercial or economical point of view), to convert the ore into metal. Without iron, our various and extensive machinery would never have been constructed; and, without our machinery, our condition would probably be now similar to that of Spain, where ignorance and superstition cement the basis of an odious tyranny. Manufactures lead to wealth;—wealth to ease—encouragement of the arts and sciences—knowledge, and freedom.

Respecting the origin of Coal, our geologists seem divided in opinion:—some considering it to have been, originally, vegetable matter; and to have been brought into its present state by some chemical process of nature. Others are of opinion, that it is original carbonaceous matter crystallized in fibrous concretions.

The varieties of Coal are scientifically described by Professor

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* In 1806 it was calculated that 64,724 persons were employed in the Coal trade of the Tyne and Weir only.

Jameson, in his recent geological work, by several species, and numerous sub-species; but as an account of them will not interest the general reader, we shall give only such a description of them as regards their practical uses. In this way they are usually divided into three kinds, according to their degree of inflammability. The least inflammable kinds are Welsh Coal, Irish, and Kilkenny Coal; and Blind, or Deaf Coal; which is found in many parts of England, Scotland, America, and elsewhere. The last-mentioned Coal requires a considerable degree of heat to ignite it; but, when once kindled, combustion will last a long time: it remains in distinct pieces in the fire without caking, producing neither flame nor smoke, making no cinder, but leaving a stony slag: it makes a hot, glowing fire, like coals or cinders, emitting a suffocating effluviæ, which renders it unfit for burning in dwelling-houses. It is chiefly used in malt kilns, dyeing houses, &c. We think it might be used very advantageously in distilleries; as the ebullition of the liquid might be more easily regulated than with the flaming coal—a circumstance of the utmost importance to the quality of the spirit when distilled by naked fire.

Open burning Coal soon kindles, making a hot, pleasant fire, but is soon consumed, and producing both flame and smoke in abundance; —it lies open in the fire, and does not cake together to form cinders, its surface being burnt to ashes before it is thoroughly calcined in the middle, leaving only a white ash. Of this kind is Cannel Coal, Jet, Peacock, Splint, and most of the Coals in the Staffordshire Coal district, and in Scotland.

Close burning Coal kindles quickly, makes a very hot fire, melts and runs together like bitumen;—it makes a more durable fire than any other Coal, and burns, finally, to ashes of a brownish colour. Of this kind are the Newcastle Coal and many others. The open burning and the close burning Coal mixed together, make a more profitable fire, for domestic uses, than either of them separately. The various kinds of Coals are often found mixed with each other under ground; and some of the finer sorts run, like veins, between those of a coarser. This natural admixture is often laid, erroneously, to the charge of the coal merchant, by persons unacquainted with the circumstance.

Our engraving represents a section of the Bradley Mine, near Bilston, in Staffordshire, exhibiting at the same time, the various operations of the miners.

A. The whimsey or steam engine, for raising the coal from the bottom of the shaft.
B. The banksman.
C. One of the shafts of the mine.
D. A passage from one shaft to the other.
E. The gateway, which is the first work of the miners after the shaft is sunk; it is made from eight to ten feet in height, nine feet wide, and is carried to the whole extent of the work.
F. The bolt hole, made to cause a free circulation of air through the mine, should any part of which take fire, the bolt hole is built up.

G. Pillars left in working the ten yard coal, to support the superjacent strata.
H. An excavation, called by colliers a stall, who, after the gateway is made, begin thus to work the coal, or *hole under.*
I. The rib through which the air-way is cut.
J. Lights.
K. A man who hangs on the skips and rakes the gateway.
L. M. N. Miners *heading, holeing,* and shovelling out the slack or small coal.
O. Slack carrier.
P. A miner working on a scaffold.
Q. The spern, a small piece of coal left as a support to many tons above, which fall when this is taken away.
R. A collier on a scaffold, taking out the spern as far as he can reach with a pick.
S. A collier standing upon a heap of slack, called the gob, with a prong, used for that work, which cannot with safety be done with a pick.
T. A collier breaking or turning out coal.
U. A collier loading a skip.
V. A collier breaking the large coal with a wedge.
W. A driver with an empty skip.
X. A driver with a loaded skip.
Y. A skip being drawn up the shaft by the engine.*
Z. A pillar, called the Man of War, which is left to support the upper strata until the lower are worked; it is then taken away, and the upper coal falls down.

The different strata that are cut through to arrive at the principal bed of Coal, are exhibited on the left of the shaft, by variously shaded portions of the solid earth, which in Bradley Mine are as follow:

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* The rope or chain by which this loaded skip is drawn up, passes round a wheel worked by the Steam Engine, and returns to the other shaft of the mine (not shewn in our engraving) where it lets down an empty skip, which is immediately released on its arrival at the bottom, and a loaded skip hooked on to be drawn up as the one shewn descends when empty. It is an astonishing and highly amusing sight to a stranger, in the neighbourhood of Birmingham, and in other coal and iron districts, to behold at a single coup-d'œil, a vast number of steam engines, with all their massive machinery and apparatus, simultaneously at work in the open air; some employed in drawing up the iron ore, others coals; which as they emerge from the earth, are sometimes lifted upon an elevated rail road, from whence, by their own gravity or by the aid of machinery, they are at once conveyed with the rapidity of lightning, and thundering in their progress to their destination the contents instantly discharged, and the emptied skip brought back (by the advance of another that is loaded) to the mouth of the shaft, again to descend into the bowels of the earth to be re-loaded, in endless succession. The effect of this scene at night is beyond our feeble powers of description, it is in every respect a moving scene; the numerous coke works just give sufficient light to see indistinctly all that is going forward, while the frequent flashing of a more intense light from other sources give a playfulness to the shadows, which picture to the mind a vast multiplication of objects.

	ft.	in.
1. Soil on the surface,....	1	6
2. Clay and ratch,.....	9	0
3. Clunch,.....	2	6
4. Ironstone, ...	0	2½
5. Clunch,.....	2	0
6. Ironstone,.....	0	2
7. Soft clay, ...	0	2
8. Dark batty clunch,....	3	0
9. Gray jointy rock,.....	4	0
10. Ironstone,.....	0	1½
11. Rockbinds mixed with ironstone,.....	4	0
12. Soft parting, ...	0	1
13. Strong black rock,....	4	0
14. Dark clunch,.....	7	0
15. Ironstone,.....	0	5
16. Dark clunch, with measures of ironstone, ...	5	0
17. Dark clunch with ditto,	0	10
18. Soft clay, ...	1	8
19. Batt, ...	2	3
20. Brooch coal,.....	3	6
21. Fire clay,.....	0	4
22. Black ironstone, ...	0	1
23. Black earth,.....	1	6
24. Ironstone,.....	0	2
25. Black earth & ironstone	1	6
26. Ironstone,.....	1	5
27. Rock binds with ironstone, ...	10	0
28. Dark earth & ironstone,	6	0
29. Rock binds with ironstone,.....	9	0
30. Peldon,.....	4	0
31. Gray rock,.....	23	0
32. Dark clunch, ...	2	0
THE MINE.		
33. White coal,.....	3	0
34. Tow coal,.....	2	3
35. Benches and brassils,..	4	6
36. Foot coal,.....	2	3
37. Slip batt,.....	2	3
38. Slips,.....	2	3
39. Stone coal parting,....	0	4
40. Stone coal and patchels	4	6
41. Penny coal,.....	0	6
42 Springs and slipper,...	4	6
43. Humphrey batt,.....	0	4
44. Humphreys, ...	2	3
Depth to bottom of the shaft	139	4

In other mines (and probably in this at a greater depth) a single stratum will sometimes occur, of from 100 to 200 feet in thickness, with very little difference throughout the whole mass. The strata is represented in Bradley Mine as nearly horizontal, but this is seldom the case, the strata lying generally in an inclined position to the horizon, which is called by the miners the dip. In consequence of this dip or descent most of our mines have been commenced working near to the surface of the earth, and as the coal has been cleared away, the mining progressively goes on deeper and deeper. At Newcastle many of the mines extend to a considerable distance. At Whitehaven the Coal works are extended more than a mile under the sea, and at between six and 700 feet below its bottom; and it has been observed, generally, that the Coals at the greatest distance under the sea are the best in quality,—hence, the distinguishing term Sea-Coal.

We have not before us an estimate of the present consumption, or extent of the trade in Coals; but we find that Pennant states the shipping at Newcastle, in 1776, to be as follows:

Coasting Trade....	3,585 Ships,	689,090 Tons.
Foreign Ports	363 ..	49,124 ..

Nearly four thousand ships from one port alone in 1776! Since that time our consumption and trade must have greatly increased, owing to our augmented population, the vast number of our steam-engines, and the manufacture of that wonder of our day, hydrogen gas for illumination; by which means Coal is now made the agent of

light as well as of heat. Some years ago the annual consumption of London was estimated at 600,000 chaldrons—we may, therefore, safely calculate the present to be nearer to 800,000 chaldrons.

AN IMPROVED EAR TRUMPET.

Dr. T. Morrison, of Aberdeen, has lately communicated to the world an improved form of an Ear Trumpet, that those labouring under deafness may reap from his improvement the advantages which (as he states) he, unexpectedly to himself, enjoys. For a series of years he had been subjected to the inconvenience of a defect in his hearing, which, he observes, extremely contracted his social enjoyments. He applied in every quarter, including his majesty's aurist, for the most improved Ear Trumpet. From none of these instruments was the most trivial benefit derived. It afterwards occurred to him that every trumpet he had made trial of, had the sound conveyed through a very small tube, the orifice of which was inserted in the ear; and conceiving this construction to be very erroneous, he ordered one of a very different form to be made of the finest block tin, one end of which included the whole external ear, the other end made as usual, to collect the sound, but the tube which conveyed the sound was an inch in diameter, and the whole length of the instrument $5\frac{1}{4}$ inches. The Doctor states the result as gratifying beyond his most sanguine expectations, enabling him to carry on a conversation with a friend with the utmost ease to himself, and without exertion to the person addressing him.

NEW MATHEMATICAL INSTRUMENT.

Mr. Jopling, the architect, has lately invented an apparatus for the organical description of curved lines, which promises to be of considerable utility in those branches of art to which the science of mathematics is applicable. It consists of two planes, the one fixed, the other revolving. A pencil holder is attached to that which is fixed, and which is capable of moving and fixing the pencil to any position on the plane which revolves. In the upper side of the fixed, and the under side of the moving plane, are placed cross grooves, of which the edges are graduated, so as to set the slides to any position. To the slides you affix certain cranks, and accordingly as they are varied in position, may the action be also varied, and changes of curves produced ad infinitum. The invention is ingenious and simple; and has received the commendation of Dr. Gregory, of the Royal Military Academy, and other scientific gentlemen. In consequence of its applicability to the engraving art, Mr. Jopling has invited Sir William Congreve, who is understood to be still engaged in inventing a new plate for bank notes, to an inspection of it, to try whether it may not be made subservient to that purpose.

"*To the Editor of the Register of Arts and Sciences, &c.*

"November 20th, 1823.

"Sir,

"Seeing in your publication of Saturday the 15th instant, a plate, representing an Invalid Bedstead, with the description thereof, as made by a Mr. Rawlins, of Pentonville, who is declared to be the inventor. Now, Sir, without the slightest wish or desire to deprive Mr. R. of any portion of the business or profits of making and selling those Invalid Bedsteads, I feel it due to myself to state that Mr. R. is not the original inventor, nor is the invention new, although it has never been forced upon the public; but, in the course of an extensive practice of rendering mechanical assistance to invalids, and curing the various deformities to which the human body is subject, I have had occasion to make, and have actually sold a considerable number of couches, sofas, and planes, exactly the same as represented in your plate. The difference between a sofa and a bedstead, I conceive, is only the addition of posts to the latter, as I have two in my own private use that have been made these ten years past.

"You, and Mr. R, or any one else, by calling on me, may inspect them; and so far from wishing to detract from Mr. R's merit, (except the invention which I claim) I shall be happy to afford him any assistance in my power for the advantage of the afflicted generally.

"Yours, &c.

"CHARLES CALLAM."

"Institution for curing Deformity,
"57, Great Queen Street, Lincoln's Inn."

CURIOUS AMERICAN CORN MILL.

The machinery is fastened to a flat-bottomed boat, and is moved by means of a wheel on the side, which is placed in the current of the river, where the boat is moored, until the grain is ground; after which it is rowed to the bank, or to another place, to receive a fresh supply.

The miller lives with his family on board the boat, in a sort of cabin, which shelters them from the weather.

DESTRUCTION OF ANTS.

Ants.—These insects are too well known to need any description here; but the method by which they may be totally eradicated from pasture or other land ought to be more generally diffused, as the mischief they do is incalculable; whether by the waste of land in making their hills, the hindrance they present to the scythe, or the scanty and pernicious nourishment such pastures afford to cattle.

The following is the best remedy human ingenuity has at present been able to devise:—"Lay open the ant-hill to the depth of seven

or eight inches below the natural surface of the ground, and in the hole thus made put some human ordure, then cover up the place; this will kill great numbers, and effectually drive the rest away:—let not the simplicity of the remedy deter any one from a trial. Should any one wish to procure a skeleton of any small animal, such as a mouse, bird, &c. he will find Messrs. Ants the best workmen in the world." Enclose the subject in a small box, with perforations large enough to admit the ingress and egress of these insects, and in a month's time these operators will produce him a perfect skeleton.

Fig. 2.

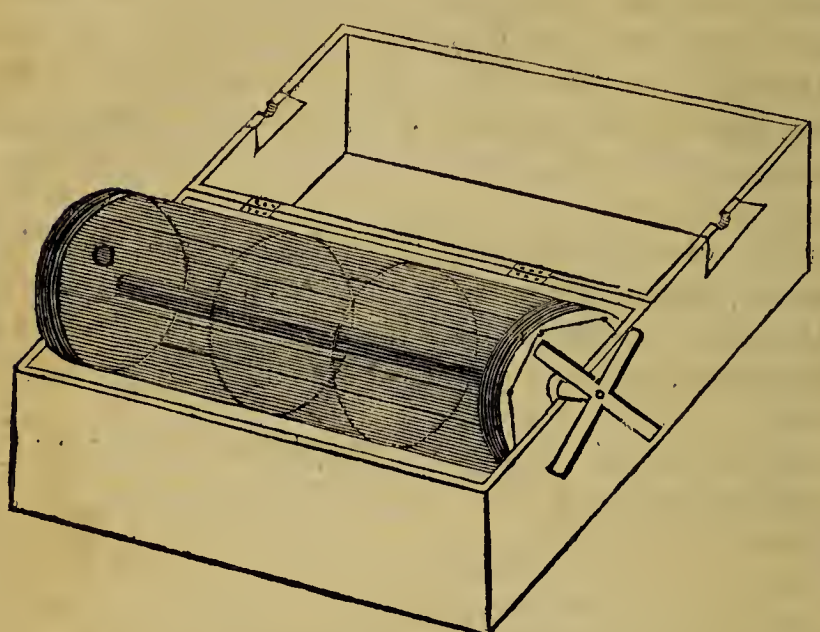
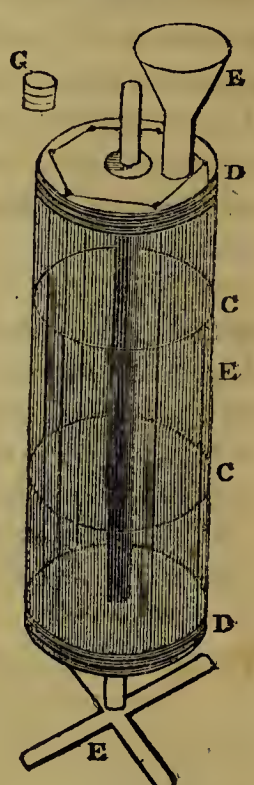


Fig. 1.



IMPROVED DRUM SIEVE FOR DRUGGISTS, CONFECTIONERS, &c.

"MR. EDITOR,

"BEING a reader of your Register, and observing in your last number an account of the improved shutter hinges, I have already availed myself of that simple and useful contrivance, and find it to possess all the advantages which you described.

"The gratification and information I derive from reading your little work makes me desirous to add my mite in its support. With this view I purpose sending you now and then an account of some humble inventions of my own, such as I have proved by practice to possess decided advantages over those which they are intended to supercede. I now present you with an account of an Improved Drum Sieve with drawings, and should you deem the subject of sufficient importance to fill up a corner of your Register, when you are short of matter, you and the public are extremely welcome to it.

"I have called it an improved Drum Sieve, rather to shew that the object of its application is the same as the common drum sieve, notwithstanding it is in form very dissimilar. It may be necessary to inform some of your readers, that the common drum sieve is so denominated from being of the figure of a drum, and that its use is for sifting very fine powders. It consists of three parts or sections, the top and bottom sections are covered with parchment or leather, and fit over and under a sieve of the usual form, which is placed between them. Being thus closed in, the operator is not annoyed by being powdered all over, nor the surrounding objects covered with dust; the sifted powder being received at the bottom of the Drum, and the upper part keeping it from flying off. The operation of this kind of sieve is extremely slow; it is besides expensive, and is soon worn out: my improved Sieve will do as much work in a tenth part of the time, will last ten times as long, and cost only half the money at first, which makes it, in fact, but a twentieth part of the expense. The expense, however, is not the chief consideration; the increased celerity with which the work is got through, being its most important recommendation.

"*Fig.* 1. represents a hollow cylinder, the exterior of which is formed of fine muslin or lawn, stretched upon the ends D D, which are like pulley wheels. It is made as follows: Two pulley wheels D D, of about six inches diameter, are fitted upon a wooden (or metal) spindle; the two ends of the spindle serve as bearings upon which it is to revolve, and at the extreme of one end of the spindle is fixed a handle to turn it by. In the accompanying drawings it is made in the form of the cross, as that figure forms a foot for the cylinder to stand upright upon, as seen at *Fig.* 1.; (this form of handle is not, however, desirable, but for that purpose, a simple crank is perhaps the most handy to use.) Two rings of stout wire, C C, are then formed of the same size as the pulley wheels, to which they are attached by means of some fine annealed wire, which run longitudinally along the cylinder, and are passed round the heads of screws fixed in the pulley wheels, (as seen at the top of *Fig.* 1,) and then turned back over another, and so on, till the frame of the cylinder is formed to receive the covering of muslin or lawn; this is prepared, by measuring the circumference, and sewing it up in a single seam, as a sleeve, open at each end; it is then drawn over the cylinder; the next point is to fasten it down, and stretch it out smooth; this is done by tying down one end of the muslin on one of the exterior of the three grooves in each pulley wheel, then to fasten the other end exactly in the same manner; there remain two more grooves in each pulley wheel, into which the sleeve may be drawn by passing a cord over them, thus tightening it to any degree required; the more smooth and even it is stretched, the better it will sift. The material to be sifted is then poured into the cylinder by means of the funnel, which is afterwards taken out, and the hole stopped by the cork G. The cylinder is then placed in the box (*Fig* 2), and the lid being closed upon it, it is worked by the hand backwards and forwards, *only half-way round,* (the rotary motion not being so effectual) this

change in the motion throwing the whole of the contents of the cylinder upon its extended surface, by which means, the fine impalpable powder is separated from the grosser contents with a rapidity that will surprize the operator. The cylinder is then taken out of the box, and emptied by withdrawing the cork, holding that part downwards, and giving the cylinder a few turns.

"As seen by the drawing *Fig.* 2, the box which contains the cylinder is divided into two equal parts, so that when open, as exhibited, the lid may rest upon the same plane as the bottom. This will be found convenient to lay the cylinder in occasionally. The box as well as the cylinder may of course be made of any dimensions; and the muslin or lawn coverings of all degrees of fineness, to be used as occasion requires: or several cylinders with sleeves of different fineness for sifting various materials will be found very convenient to druggists. The machine I have in use is 18 inches long, 10 inches wide, and 10 inches deep, with the gudgeons made of hard wood, which answer the purpose extremely. I have sifted with it several hundred weight of the finest impalpable powder, and it does not appear to be worn.

"In conclusion, I beg to add, that I am well assured, that every druggist, confectioner, or other persons, after having seen or used one of my Improved Drum Sieves will never use any other; unless they can improve upon the idea. By adding a simple crank to the spindle it may of course be worked by any other power.

"L. H."

CHEMISTRY, MEDICINE, DOMESTIC ECONOMY. *&c. &c.*

The best and cheapest Filtering Machine may be constructed as follows:—Procure a large stone bottle with the bottom knocked out, stop up the neck with small stones, over these form a layer of small pebbles, then another of gravel, increasing every layer in fineness, and putting on, lastly, a stratum of fine sand of the depth of several inches. The sand, gravel, &c. should of course be previously well washed, until the water runs off clear and tasteless. The common filtering stones are soon rendered unserviceable by the filling up of the pores; this apparatus on the contrary is a perpetual Filtering Machine, by merely taking out, occasionally, the upper stratum of sand, and washing it: it will also filter large quantities of water in a short time, of which the common filtering stones are wholly incapable.

Test for Wines.—The following test for the detection of lead, in any form, when used in the adulteration of wines or liquors, is recommended both for its simplicity and certainty. One ounce of yellow orpiment, which can be purchased genuine at any respectable colour-shop, and two ounces of quick lime, are to be powdered separately,

and then mixed:—put this powder into a glass bottle, and pour upon it twelve ounces of pure rain water, and cork it down tight; then digest in a moderate heat for twenty-four hours; or, if this method be too tedious, boil it for half an hour, and it will do as well. Let it grow cold, and when clear, pour it off, and keep it in a bottle well corked; otherwise, the virtue of the liquor will evaporate. When about to examine whether White Wine be adulterated, pour a few drops into a clean glass half full of wine; if it changes from a yellow to a red, brown, or blackish colour, and is likewise turbid, in proportion as these changes are more or less apparent, so must the adulteration, by means of lead, have been in a greater or less degree; but, if not so adulterated, a milky, pale cloud only will be produced.

RULES FOR ASCERTAINING THE IMPURITY OF WATER.—Water is rarely found in a perfectly pure state. It almost invariably contains some portion of earthy, saline, vegetable, animal, or metallic matter, which is derived from the substances over or through which it flows. These substances being more or less held in solution, filtration will of course only separate that which is undissolved and floating in it; ignorant persons should not therefore conclude because water has been filtered, that it is pure and fit for drinking; as it might contain a deadly quantity of lead in solution and yet be perfectly bright and transparent. Most Waters, however, that are turbid only require filtration to render them salubrious. The most certain and direct way of purifying Water is by distilling it with some fresh charcoal.

The Impurity of Water may be ascertained by comparing it with that which is known to be pure, or distilled Water.

Impure water is heavier than pure water.

Impure water is thinner, has less fluidity, than pure water.

Impure water has some taste, colour, or smell,—pure water has none.

Impure water, that contains earthy and metallic salts, is called *hard water*, being not so soft to the touch as pure water, nor does it wet any substance so readily as pure water.

MEDICINAL PROPERTIES OF IRON.—"Iron is one of the most valuable articles of the materia medica. The protoxide acts as a genial stimulant and tonic in all cases of chronic debility, not connected with organic congestion or inflammation. It is peculiarly efficacious in chlorosis. It appears to me that the peroxide and its combinations are almost uniformly irritating, causing heart burn, febrile heat, and quickness of pulse. Many chalybeate mineral waters contain an exceedingly minute quantity of protocarbonate of iron, and yet exercise an astonishing power in recruiting the exhausted frame. I believe their virtues to be derived simply from the metal being oxidized to a minimum, and diffused by the agency of a mild acid through a great body of water, in which state it is rapidly taken up by the lacteals, and speedily imparts a ruddy hue to the wan countenance. I find

that these qualities may be imitated exactly, by dissolving three grains of sulphate of iron, and sixty grains of bicarbonate of potash, in a quart of cool water, with agitation in a close vessel." *Ure.*

WHITE PAINT PRESERVED FROM THE DESTRUCTIVE EFFECTS OF THE COAL GAS.—It is a common complaint that the Coal Gas, now so universally employed for lighting our shops and houses, destroys the colour of the white lead paint, turning it by degrees to a perfect black. We have reason to believe that this effect may be wholly prevented by giving the paint a good coat of varnish, which will defend it from the action of the destructive agent evolved by the Gas. It would, therefore, have the two-fold advantage of preserving the brilliancy of the colour for a long series of years, and of causing no impediment to the reflection of the rays of light emanating from the gas.

ATMOSPHERIC PRESSURE.

THE rise of water in a pump was formerly attributed to the horror that nature had of a vacuum. This absurd notion was however refuted about the middle of the 17th century, by the following occurrence.

The Duke of Florence having occasion to raise water to the height of 50 or 60 feet, ordered a common pump to be made for that purpose, but when it was completed, the workmen were astonished to find it would not work. The matter was referred to the celebrated Galileo, but he was unable to account for it. All they could determine was that water would not rise in a common pump more than from 32 to 35 feet. The fact remained inexplicable until the philosophers of Europe, caught the idea of Atmospheric Pressure from the important experiments of Torricelli, which were performed by him in the year 1643, and made known to the world in 1667 by the publication of the "Transactions of the *Academie del Cimento.*" Since then, the suspension of mercury in the barometer, and water in the pump have been well understood.

The pressure of the atmosphere may be shewn by a very simple experiment. Place a card on a wine glass *filled* with water; then invert the glass cautiously and the water will not escape; the pressure of the atmosphere on the outside of the card being sufficient to support the water. I. S. B.

A CHEAP MODE OF MANUFACTURING A BAROMETER.

TAKE a common phial bottle and cut off the rim and part of the neck. This may be done by a piece of string, or rather whipcord, twisted round it and pulled strongly by two persons in a sawing position, one of whom holds the bottle firmly in his left hand; heated in a few minutes by the friction of the string, and then dipped suddenly into cold water, the bottle will be decapitated more easily than by any other means.

Let the phial be now nearly filled with pump water, and applying the finger to its mouth, turn it quickly upside down : on removing the finger, it will be found that only a few drops escape. Without cork or stopper of any kind, the water will be retained within the bottle by the pressure of the external air, the weight of air without the phial being so much greater than the small quantity within it. Now let a bit of tape be tied round the middle of the bottle, to which the two ends of the string may be attached so as to form a loop to hang on a nail : let it be thus suspended in a perpendicular manner, with the mouth open, downwards, and this is the Barometer.

When the weather is fair, and inclined to be so, the water will be level with the section of the neck, or rather elevated above it, and forming a *concave* surface. When disposed to be wet, a drop will appear at the mouth, which will enlarge till it falls, and then another drop, while the humidity of the atmosphere continues. To the truth of this experiment I can give my *probatum est*, but shall be glad if any of your scientific correspondents will explain more particularly the *ratio* of it.

Why will not the water remain in the bottle unless the rim be cut off ? which is the fact. Why should the water drop in moist weather, when (as I have tried) holding the bottle before the fire will produce the same effect ?

The following is an Answer from the Times Newspaper.

Having tried the experiment mentioned in your paper of yesterday, of making a Barometer of a common glass phial, I beg leave to say, in reply to your correspondent's wish, that I consider the reason of the water dropping when placed near the fire, as caused by the rarification of the air making the atmospheric pressure to be less on the water ; and in the case of the rim being left on, I do not doubt but the attraction between the water and the edge of the glass is sufficient to counteract the pressure of the atmosphere on the water in the phial, which being by that means out of the neck, has no longer any thing to prevent its dropping. If you think this reply worthy of insertion, you will oblige a constant reader.

Borough, Nov. 14, 1823. J. E.

Specific Gravity.—Archimides was the first who discovered the specific gravity of bodies. The King of Syracuse commissioned to him to investigate the metals of a golden crown, which he suspected to have been adulterated. The philosopher laboured long and arduously at the problem, but without success. One day as he went into the bath he perceived that the water rose in it just in so much proportion as his body was immersed : he immediately saw that another substance of equal size would have raised the water just as much, although one of equal weight and of less magnitude could not have produced the same effect. Transported with delight at seeing the king's question so easily within his answer, he leaped from the bath, and " running naked through the streets, cried out, " *I have found*

it, I have found it." He then provided himself with two masses, one of gold and one of silver, each equal in weight to the crown, and having filled a vessel accurately with water, he first plunged the silver into it, and observed the quantity of water that flowed over; he then did the same with the gold, and found that a less quantity had passed over than before, though of equal weight; he perceived that the bulk of the silver was greater than that of the gold, and that the quantity of water which was displaced, was in each experiment equal to the bulk of the metal. He next made a like trial with the crown, and found it displaced more water than the gold, and less than the silver, which led him to conclude that it was neither pure gold nor pure silver.

THE ELEMENTS OF NATURAL PHILOSOPHY.

(Continued from Page 28.)

No. III.—Mechanics.

32. Whatever gives motion or action to a body is called a *machine.*

33. The body moved is called the *weight*, and that which moves or supports the weight is called the *power.*

34. When the motions in the weight and power are equal, the machine will be balanced, or remain in *equilibrio.* When they are unequal, or either of them preponderate, the greater quantity will overcome the lesser and give action to the machine.

35. It is necessary to suppose, (in considering their powers and properties), that all machines are mathematically true, perfect, and uninfluenced by the operations of friction.

One third must always be allowed, in the operation of mechanical powers for the friction to be overcome; that is, supposing nine pounds be required to balance any weight, with a mechanical power, twelve pounds will be necessary, from the resistance of friction, to give it an efficient action.

36. The *mechanical powers* or simple machines are six, viz.

1. The *Lever*, or Balance.
2. The *Wheel and Axle.*
3. The *Pulley*
4. The *Inclined Plane.*
5. The *Wedge.*
6. The *Screw.*

37. The Lever is a bar of iron, or other substance, supported by, and moveable on, a *fulcrum* or prop, which is the centre of motion. There are three kinds.

1. When the fulcrum is between the weight and power.

This may be illustrated by the poker used in stirring the fire;—the bar of the grate, upon which it rests, being the prop, or *fulcrum*; the hand, at the one extremity, the *power*; and the coals, at the other, the weight to be moved.

2. When the weight is between the power and the fulcrum,—and,
3. When the power is between the fulcrum and the weight.

As may be shewn by the raising of a ladder; supposing the weight to be attached to the elevated end—the man the power—and the ground the fulcrum.

38. The WHEEL AND AXLE consists of a cylinder, and a wheel attached concentric to it.

39. The advantage, or power gained, is in just so much proportion as the wheel is greater in diameter than the axis with which it turns.

40. So that if the axle be the tenth part of the diameter of the wheel, one pound will sustain ten, and so in proportion.

41. The PULLEY is used for moving great weights, by means of a rope passing over a small wheel.

42. Pullies are of two kinds—*moveable* and *fixed*.

43. The *moveable pulley* is fixed to the weight, and falls or rises with it—and the advantage resulting from it is as two to one; that is to say, a power of one pound will balance a weight of two.

44. The *fixed pulley* merely alters the direction of the power, and is of no further advantage.

45. By the means of the fixed pulley, a weight may be raised to any altitude, without the person moving from the spot on which he exerts the power.

46. The INCLINED PLANE is merely a surface making an oblique angle with the horizon, and is used to move bodies from one level to another.

47. The force with which a body descends upon the *inclined plane*, is to the force by which it would descend perpendicularly, as is the height of the plane to the height of the body.

48. The WEDGE is an important mechanical power, and may be regarded as, simply, two inclined planes united.

49. The advantage derived is in proportion as the length of the sides is greater than the back; or, as the length of one of its sides is greater than one half of the back.

50. It is used in cases where no other mechanical power is available; as in splitting wood, rocks, &c.

51. The SCREW is nothing more than an inclined plane, used with a lever, or, as it is called, a winch, to turn it—and assists in raising weights, or in pressing bodies closer together.

52. The power gained, is in proportion as the circumference of the circle made by the winch, is greater than the distance between the *threads*, or spiral projectors of the screw.

53. The longer the winch, and the nearer the spiral windings, the greater will be the power obtained.

54. When a screw turns in a wheel it is termed an *endless screw*.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1822, 1823.

ULTRAMARINE.—To the person who shall prepare an artificial ultramarine, equal in colour, brilliancy, and durability, to the best prepared from the lapis lazuli, and which may be afforded at a cheaper rate. *The Gold Medal, or Thirty Guineas.*

MACHINE FOR RAISING COALS, ORE, &c.—To the person who shall invent and produce to the Society a machine for raising coals, ore, &c. from mines, superior to any hitherto known, or in use; and which shall produce the effect at less expense. *The Gold Medal, or Fifty Guineas,*

LIST OF PATENTS.

SIR WILLIAM CONGREVE, of Cecil Street, Strand, Middlesex, Baronet, for various improvements in fire works. Dated Oct. 16, 1823.

JOSEPH ROGERSON COTTER, of Castle Magnor, near Mallow, Cork, Ireland, clerk, for certain improvements on wind musical instruments. Dated Oct. 9, 1823.

JOHN HENFREY, of Little Henry Street, Waterloo Road, Surry, engineer, and AUGUSTUS APPLEGARTH, of Duke Street, Stamford Street, Blackfriars, Surry, printer; for certain machinery for casting types. Dated Oct. 9, 1823.

JOHN CHRISTIE, of Mark Lane, London, merchant, and THOMAS HARPER, of Tamworth, Staffordshire, merchant; for an improved method of combining and using fuel in stoves, furnaces, boilers, and steam engines. Dated Oct. 9, 1823.

TO CORRESPONDENTS.

WE thank Mr. C. for the offer which he makes to us, and shall be glad to receive from him any drawings and descriptions of his new inventions, that he may conceive to be adapted to our publication.

We shall be happy to receive from C. C. the communication mentioned in his note, in such a form as shall appear to him best adapted to convey the information he proposes.

"A Friend to the Diffusion of Knowledge" is informed, that the subject he alludes to is well fitted to our publication; we are anxious to give to his wishes every consideration, but he must be aware that the matter requires some revision before going to press.

We are much beholden unto J. V. for "the high consideration in which he holds our exertion and ourselves." Complimentary approbation is a very fine thing to a man as a man; but we have merged the man in the importance of the Editor, and our editorial functions preclude us from laying aside the gravity with which that exalted office is invested. We confess that our stoicism has oftentimes since our young career (from the such-like effusions that are thickening upon us) been upon the point of relaxation; but as we are well persuaded there is no earthly publication comparable to our own, we must take these "high assurances" as simply the inevitable consequence of our own exalted merits!!!

We assure "A Correspondent" that we are not actuated by feelings of hostility. We have abstained from noticing the matter he speaks of, for reasons best known to ourselves. When the proper season shall arrive we will act. We have a good deal to say about it, but we wish not to be premature in our fiat of laud or condemnation.

We must defer our reply to other Correspondents till our next.

[*To be continued every* FORTNIGHT.]

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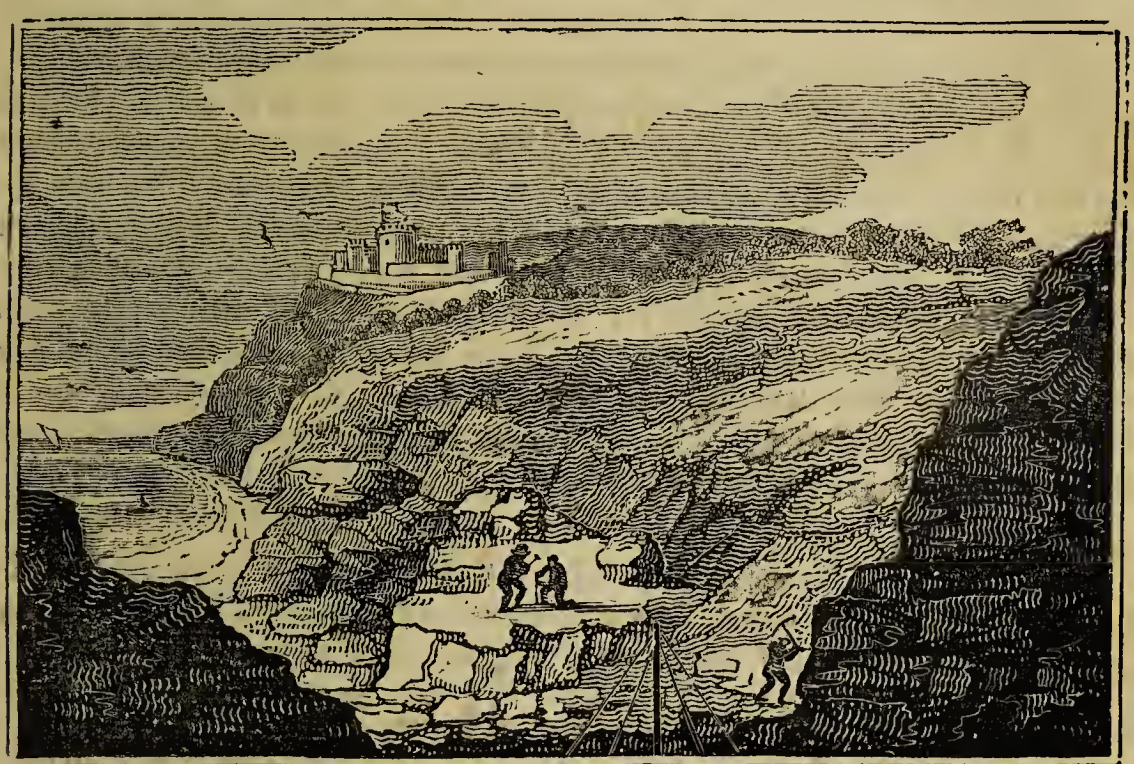
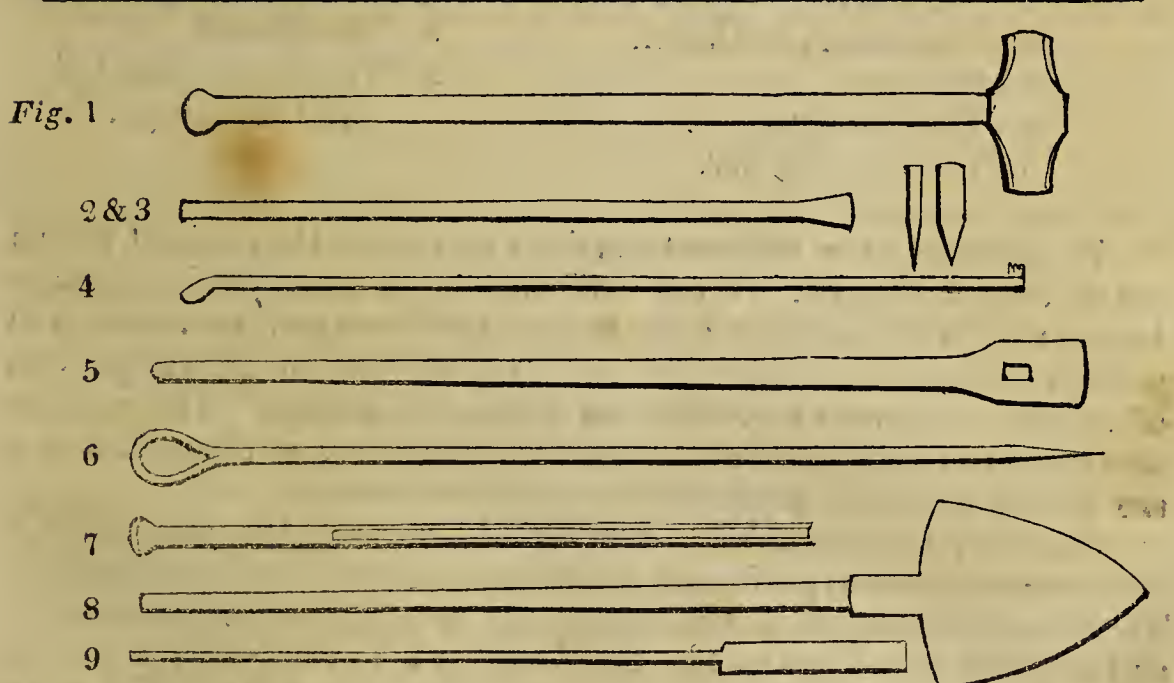
No. 5.] SATURDAY, DECEMBER 13, 1823. [Price 3*d.*





STONE QUARRY, JERSEY.

AMONG the million of inhabitants of this metropolis, there must be a vast number of persons who have never seen a quarry, and who are unacquainted with the manner in which those masses of stone are

obtained, which we see daily drawn through the streets: we have therefore selected the present subject for the information of that portion of our readers, to whom we trust it will not prove unacceptable; notwithstanding we purpose rendering it very concise, to make room for other matter of, perhaps, more general interest.

Our engraving represents a Quarry situated in Jersey, which are very numerous in that island, and consist of granite, porphyry, serpentine, and various other kinds of stone. The price at the quarries is generally about one shilling per cart load; such is the abundance, and facility of procuring it. We have numerous quarries on our own coasts, as well as in the inland parts, which abundantly supply us with various kinds of excellent stone. It is highly desirable that such works should be situated near to some river or canal, or on the sea coast, unless it be required for building purposes very near to the spot, as the great expense of land carriage of many miles in such a material cannot be afforded. There are many instances in which canals have been cut solely for the conveyance of the stone,—in others, iron and wooden rail roads have been constructed to lessen the labour of the draught. Some of these rail roads being on a slightly inclined plane, the loaded carriages are impelled forward by their own gravity to considerable distances.

The Implements made use of by the miners or quarrymen, although few and simple, are very efficient in their expert hands. They are represented in our Engraving, and are as follow:

Fig. 1. The Sledge Hammer, or Mallet.
2. The Borer, or Chisel.
3. Wedges.
4. The Scraper.
5. The Claying Bar.
6. The Needle.
7. The Tamping Bar.
8. The Shovel.
9. The Fusee, inserted in the Charge.

In separating the different portions of stone, the readiest means are of course adopted. When the mass to be removed is not very large, and is surrounded more or less with fissures, by which it is partially unconnected with the rock, the driving in of wedges will often be sufficient to produce an entire separation. The wedges also serve to remove from their beds, those portions of the rock which are already naturally separated by cracks or fissures.

Blasting, by gunpowder, is resorted to where the rock is solid and compact; and to perform the operation only two men are requisite. The miner's judgment directs him to the fittest place for the charge; and a hole is bored or cut into the hard rock to receive it, which is effected in the following manner. The Borer, or Chisel, *Fig.* 2. is held by one man, whilst it is struck with a sledge hammer by the other; the man holding the Chisel turning it at every blow, so as to cross the previous cut, by which means the stone is chipped away by degrees. The boring, or cutting, is occasionally suspended, to clear

out the hole, which is done by the Scraper, *Fig.* 4.; then the cutting, or boring, is resumed; and so on alternately, boring and clearing out, till the perforation is of the required depth, which is from one to three feet, according to circumstances; and the diameter usually about an inch and a quarter. If the hole is wet, some tough dry clay is introduced, and the Claying Bar, *Fig.* 5. is driven in with great violence, by which means the clay is forced into all the crevices, absorbing the moisture, and preventing the entrance of more; on withdrawing the Claying Bar, the hole is left dry, and of an uniform smooth surface, which adapts it for receiving the charge. The charge is generally of gunpowder alone, or mixed with quicklime, (which it is said increases the force of the explosion), and is contained in paper as a common cartridge, to fit the bore; in very wet situations, a tin casing is used to enclose it. The charge being now introduced, and thrust to the bottom of the hole by means of a thin, copper, tapering rod, called the Needle, *Fig.* 6. which is also driven down into the charge. The next operation is to exclude as much of the air as possible, by reducing the size of the vent; for which purpose, the Tamping Bar, *Fig.* 7. is employed in ramming round the Needle, some yielding, yet compact substance, so that when the Needle is withdrawn, a very small vent, or touch-hole remains. Into this perforation is dropped a fusee, or rush, charged with powder, on the top of which is fixed a "snuft," as it is called, or some other contrivance, so adjusted as to burn a sufficient time to permit the man who fires it to retreat to a proper distance. Previous to firing it, it is usual to give notice, to all persons in the immediate neighbourhood, by the blowing of a horn, that they may have the opportunity of retiring to some place of security.

PORTABLE GAS LAMP.

We have received the following Letter from Mr. Gordon, to which we give ready insertion.

"*To the Editor of the Register of Arts and Sciences, &c.*

"Sir,

"The Editor of the London Journal of Arts, having in the Thirty-sixth number of that work, page 317, unwarrantably stated '*that my patent right had merged into a Company, which was contrary to the Statute,*' and as that assertion is totally void of foundation, and may be most extensively injurious to my interest, I shall be much obliged if you will give admission to this my unqualified denial, the whole interest in the patent remaining exclusively my own; and although the Portable Gas Company have chosen to adopt my Patent Lamps for distributing *their* Gas, I yet trust that many others will follow their example.

"The approbation which you were pleased to bestow on my Invention in the first number of your Work, (and the correctness of

which is verified by the daily increasing demand for Portable Gas) induces me to hope you may find room for the following Statement.

"In consequence of seeing a letter, signed 'Prudentia,' in the Thirty-fifth number of the London Journal of Arts, the arguments of whom you so satisfactorily refuted, I addressed a letter to the Editor, rebutting the attack which was thus attempted, the receipt of which was very unexpectedly acknowledged by the following reply.

"'Chancery Lane, Wednesday Afternoon,
"'20th November, 1823.

"'SIR,

"'THERE can be no objection to the insertion of your 'letter in the London Journal of Arts, you may therefore depend 'upon its being attended to immediately.

"'I am convinced that the author of the letter signed *Prudentia* 'had no vindictive motive; I believe he has no knowledge of your 'connection with the Portable Gas Company; for my own part I did 'not know that such a Company existed: the letter in question cer-'tainly contains some observations that should not have been there, '*as they are direct nonsense. I therefore take blame to myself for* '*having allowed it to pass into the printer's hands without revision, and* '*shall for my own credit sake add such a notice to your letter.*

"'I am, Sir, your obedient Servant,
(Signed) "'W. NEWTON.'"

"D. Gordon, Esq."

"You may therefore judge of my surprize when I saw in the Thirty-sixth number of that Journal, my letter, prefaced with observations by the Editor, in which, although he had previously, to me, called some parts of 'Prudentia's letter' *direct nonsense,* he says that 'the bearing of the matter,' (Prudentia's) viz. 'the danger to be ap-'prehended from Portable Gas Lamps is in perfect accordance with 'our own views of the subject;' yet he afterwards adds, '*we do not* '*feel ourselves called upon at present to state our arguments on the* '*subject of danger.*' What ought the public to think of the Editor of a work, calling itself scientific, which states that there is imminent danger in using an Invention, but who does not feel himself called upon to state from whence the danger can arise? Or, what will the public think of the Editor of a scientific work, who admits the 'proficiency in mechanical science' of such a writer as Prudentia, who talks of the 'sudden opening of a door admitting a gust of wind' sufficiently powerful to overcome the force with which compressed elastic fluids issue from a small orifice?

"I own when I read the severe castigation which you gave Prudentia and his Editor in your third number, that I thought you scarified too deeply, but I now see that your penetration was greater than mine, and that it was well deserved.

"I am charged with having ascribed 'vindictive and acrimonious feelings' to Prudentia, of which I am totally unconscious; but, certainly, I am now inclined to suspect some other motive than sheer ignorance on the part of Prudentia and his Editor.

" With regard to the vague observations of the London Journal of Arts relative to what other experimentalists have done, I will reply to them when they appear in a tangible shape, because I think this is due to the public, and also that I should be prepared to refute every imputation of the possibility of danger which can arise from the use of the Portable Gas Lamp. The London Journal of Arts has introduced the authority of Mr. Brande, but fortunately for me, that respectable chemist has, subsequent to the description of my Lamp in the Edinburgh Philosophical Journal for October, 1819, recorded in the Sixteenth number of the Quarterly Journal, the extent to which he had carried the condensation of inflammable Gas, as an experiment, previous to my patent, and my answer will be found in the Repertory for May, 1820; after that period, M. De Ville, of the Strand, as my agent, supplied Mr. Ackerman for some months with Portable Gas; next, Mr. Caslon, after various consultations and correspondence with me, adopted the Invention, and Mr. Smith, of Lynn, obtained permission to try it there; I have also been informed that it is now introduced at Cambridge, but to what extent I have not yet had time to enquire. All these, however, certainly deviated from the plan I recommended, and I humbly ascribe their want of success to that cause.

" The subject has now become so interesting to the public, that I trust it will be an apology for occupying so much of your useful publication, and I beg in conclusion, that you will accept my thanks for the interest which you have evinced towards my Invention, and for the accurate remarks which you have made in your observations of it.

" I am, Sir, your very obedient Servant,
" DAVID GORDON."

" Portable Gas Office, Basinghall Street,
" 8th. December, 1823."

PHŒNOMENA OF SOUND AND ECHOES.

Sound appears to be merely a vibration of air owing to a certain impulse, and is subject, like light, to the laws of reflection and refraction, which produce echoes and confused noises.

Very numerous experiments have been made to ascertain the time in which Sound travels to a certain distance. The firing of cannon has usually been resorted to as the most convenient and certain means of determining it. It is commonly noticed that when a gun is fired at a considerable distance, the report is not heard until some time after the flash has been seen. Newton and other philosophers have demonstrated that light travels at the prodigious rate of 200,000 miles in a second, consequently we may consider, when we see the flash of a gun that it was fired at that instant of time, and have only to notice the time that elapses before we hear the report, which will give us the rate of speed at which Sound travels. Flamstead and Halley have calculated it at 1142 feet in a second, which perfectly agrees with our own repeated observation, having been in the habit

of noticing the firing of cannon from a castle at three miles distance, took generally about a quarter of a minute to convey the Sound; the strength and course of the wind, making some variation in the time. Dr. Derham has observed, that when a cannon was fired at a distance of thirteen miles from him the Sound was repeated five or six times in quick succession. "The two first cracks were louder than the third, but the last cracks were louder than any of the rest;" and he further observes, that in some of his stations, "besides the multiplied Sound, I plainly heard a faint Echo, which was reflected by my church and the houses adjacent." M. Garnerin, who ascended in a balloon with a lady at Paris in 1798, noticed that the earth itself reflected sound. His course being very near to the earth for several miles, he held conversations with persons beneath him, and was surprized to hear his words repeated five or six times; upon his reaching an elevation of more than 200 toises the Echo ceased, and when he again descended to his former level, his words were repeated as before. These facts serve to explain the cause of the long reverberation of thunder; from one explosion of the electric fluid, the report is reflected successively by the clouds and the diversified uneven surface of the earth.

Many substances convey Sound better than the air. If on a piece of timber fifty feet long, a watch be placed at one end, and the ear applied to the other end, the ticking of the watch will be distinctly heard, but without this medium, or some other, the ticking of the watch would not be heard at a fourth part of the distance.

(Some curious experiments on this subject in our next.)

THE SUN

NOT A GLOBE OF FIRE, AND PROBABLY INHABITED.

"The Sun appears to be nothing else than a very eminent, large, and lucid planet, evidently the first, or in strictness of speaking, the only primary one of our system; all others being truly secondary to it. Its similarity to other globes of the solar system with regard to its solidity, its atmosphere, and its diversified surface, the rotation on its axis, and the fall of heavy bodies, leads us on to suppose that it is most probably also inhabited, like the rest of the planets, by beings whose organs are adapted to the peculiar circumstances of that vast globe.

"It may not, however, be amiss to remove a certain difficulty, which arises from the effect of the Sun's rays on our globe. The heat which is here, at the distance of ninety-five millions of miles, produced by these rays, is so considerable, that it may be objected that the surface of the globe of the Sun itself must be scorched up beyond all conception. This may be very substantially answered by many proofs drawn from natural philosophy, which show that heat is produced by the Sun's rays only when they act on a calorific medium; they are the cause of the production of heat, by uniting with the matter of fire, which is contained in the substances that are

heated; as the collision of flint and steel will inflame a magazine of gunpowder, by putting all the latent fire it contains into action. But an instance or two of the manner in which the solar rays produce their effect will bring this home to our most common experience.

"On the tops of mountains of a sufficient height, at an altitude where clouds can very seldom reach, to shelter them from the direct rays of the Sun, we always find regions of ice and snow. Now if the solar rays themselves conveyed all the heat we find on this globe, it ought to be the hottest where their course is least interrupted. Again our aeronauts all confirm the coldness of the upper regions of the atmosphere; and since therefore even on our earth, the heat of any situation depends on the aptness of the medium to yield to the impression of the solar rays, we have only to admit, that on the Sun itself, the elastic fluids composing its atmosphere, and the matter on its surface, are of such a nature as not to be capable of any excessive affection from its own rays; and this seems to be proved by the copious emission of them; for if the elastic fluids of the atmosphere, or the matter contained on the surface of the Sun were of such a nature as to admit of an easy chemical combination with its rays, their emission would be much impeded.

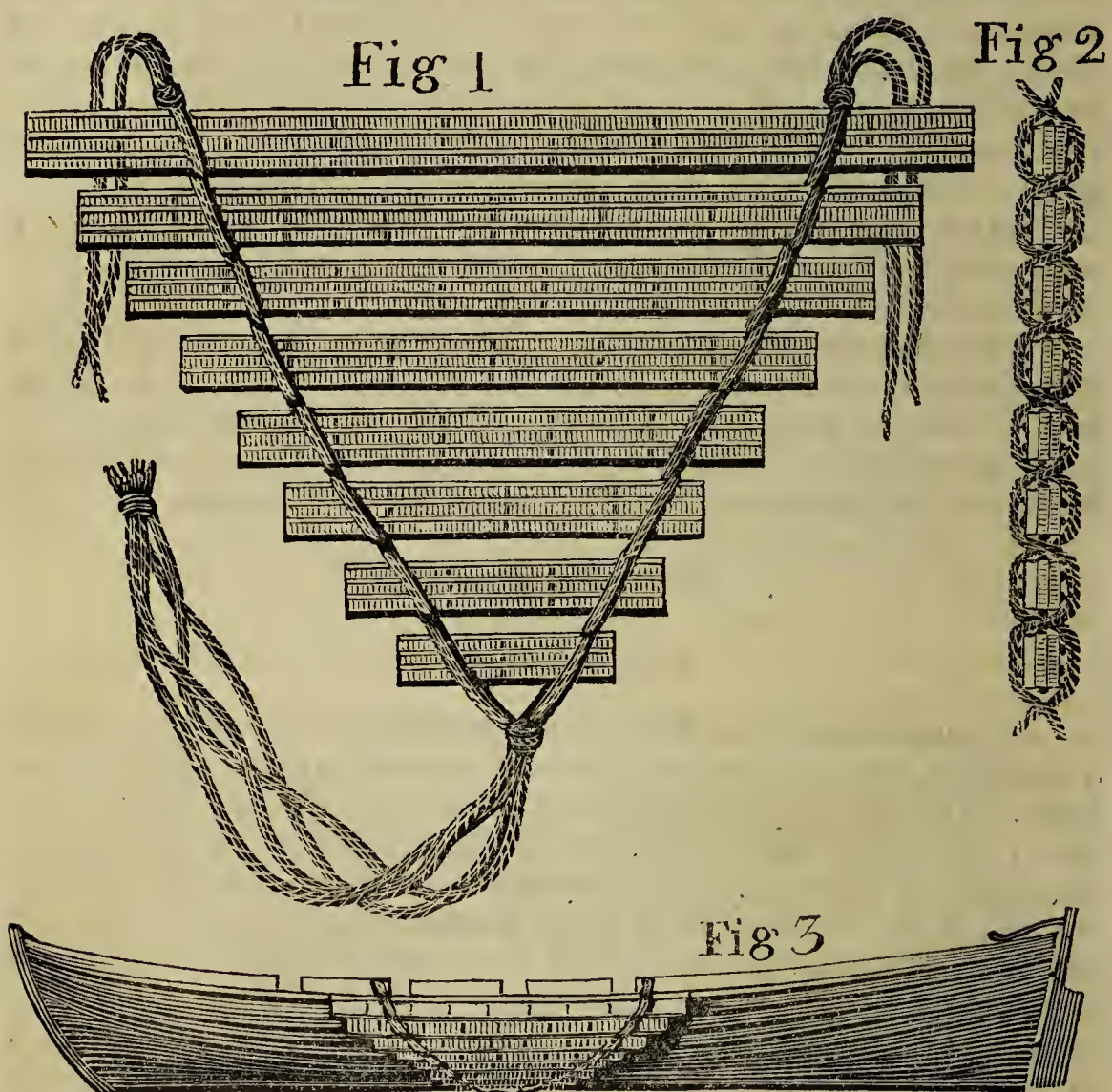
"Another well-known fact is, that the solar focus of the largest lens, thrown into the air, will occasion no sensible heat in the place where it has been kept for a considerable time, though its power of exciting combustion, when proper bodies are exposed, should be sufficient to fuse the most refractory substances."—*Herschel.*

LIFE BOATS.

It is an extraordinary fact, that no attempt was made to construct a Life Boat, or any other machine for the same purpose, until the year 1789. Owing to a calamitous, and heart-rending shipwreck, which took place on the Herd Sand, in Tynemouth Haven, in the sight of thousands of spectators, the gentlemen of South Shields called a meeting of the inhabitants, at which a committee was appointed, and premiums offered for plans of a boat, that should be the best calculated to overcome the dangers of a heavy broken sea. Various plans were submitted to the committee, but a preference was unanimously given to Mr. Greathead's, and a boat was immediately ordered to be built upon his plan. This boat was launched on the 30th of January, 1790, and so well has it answered, (exceeding, indeed, the most sanguine expectations), in the most tremendous broken seas, that in the Tyne alone, many hundreds of lives have already been saved by it; and in no instance has it failed. The figure of the boat may be simply described, by the similarity which it bears to the rind of the quarter of an orange, which has been twice equally divided, Both ends of the boat are therefore alike, which admits of its being rowed either way—and the great curvature of the bottom allows it to be turned about with considerable facility. Another great advantage to

a vessel of this figure is, that it cannot be upset, nor lie with its bottom upwards. To give it a superior degree of buoyancy it is well cased with cork, and all its arrangements are very judiciously contrived. Great numbers of these boats have since been built for all parts of our coasts, as well as for those of other nations.

Notwithstanding the important benefits that have been derived from Mr. Greathead's invention, much remained to be done. Life Boats are expensive, are not of use for burthens, and cannot be had every where. It was therefore with sincere pleasure that we hailed the simple invention of Capt. Henry Gordon, which we now present to our readers.



CAPT. HENRY GORDON's APPARATUS FOR CONVERTING A SHIP's BOAT INTO A LIFE BOAT.

" As simplicity and lightness of weight are the two principles on which the plan, now presented, is founded, it requires little reasoning to shew how very essentially such principles recommend themselves to sea-faring purposes, it being an indispensible requisite, that a boat should not be one ounce heavier than is necessary, in order that she may be as portable as possible for hoisting in and out board, and for being sent in the highest sea, and the heaviest gale, to take up a

drowning man, when fallen from the top-sail yard, either by day or night.

"The model of the boat in this draught is calculated to row six oars, which with a coxswain and midshipman makes eight men, triple this, equal to twenty-four, being the full complement of men such a boat can contain, and then there will be scarcely room for the rowers to pull freely. The buoy is composed of fine Spanish cork, and consists of eight pieces or rows, each piece being a foot longer than that immediately below it. The pieces are connected to each other by strong cord; thus producing a degree of flexibility in the triangle sufficient to allow of its being closely applied to the boat's side, each layer occupying in breadth a streak of the boat. It farther possesses this great advantage, that it is not a fixture to the boat, but may be at any time removed, and when the boat is hoisted in or out-board, always can be unshipped, so that the boat is intrinsically as light as ever; neither would it be necessary to carry it on every occasion, yet it would be the safest way never to leave the ship without it.

"It measures at the base one third of the boat's length; and is supported by split canes or bamboo, tied together by strong cord, well covered with shoemaker's wax. The pieces composing each individual row are secured by longitudinal layers of split bamboo or cane, and being thus constructed, a blow that would stave in the boat would not penetrate the triangle, owing to its elasticity.

"Large boats, such as those capable of holding a hundred men, instead of being furnished with a single large triangle on each side, should have three of nine feet each in length, by which many advantages will be obtained. First, that the same triangles would serve for boats of different sizes; and, hence, the expense of the outfit be very materially reduced: secondly, triangles of the above dimensions are more manageable, easier put on, or taken off, and more commodiously stowed away than larger ones. Thus, the launch, rowing twenty-four oars, with seventy-five men on board, might be fitted in the following manner: the barge's triangle fixed amid-ships, the cutter's on the bow, and the jolly boat's on the quarter; the launch would then be rendered completely buoyant without any additional expenses. The contrivance at once possesses these advantages: being extremely simple; affording the best security under similar circumstances; being so reasonable in its cost, that it is within the reach of every merchant ship to supply herself at a small expense; and is particularly advantageous for the preventive service to approach vessels, and visit them, when no other boat can: also to be sent with dispatches, to considerable distances in the open sea, on an emergency: to land at Deal, Yarmouth, Madras, and other beaches, when no other boat can; and to take up a drowning man in a gale of wind, when no other boat could live."—(*Capt. Gordon's Letter.)*

"Fig. 1 is the triangular buoy, on a scale of three-eighths of an inch to a foot. Fig. 2 is an end view of the same. It is formed of pieces of cork, one foot long, six inches wide, and about one inch and a quarter thick, laid three thicknesses together, and then placed end to end, till of the required length, (which is here nine feet for

the upper streak), and then joined into one streak, by lengths of split cane, laid on all four sides, and sewed well together; the different streaks are fastened together by four ropes, which are seised together between each streak; when used, the ends are drawn under the keel till the lower streak touches it, and then brought up over the side and fastened to the thwarts; the other triangle is drawn in like manner on the opposite side of the buoy, and fastened. Fig. 3 shows the buoy attached to the side of a boat, on a scale of one eighth of an inch to a foot. The triangle, here represented, diminishes one foot in each lower streak; the top one being nine feet, the next eight feet, and so on; each being six inches wide, and about four inches thick, (being made of three layers): two buoys, thus made, contain 14⅔ cubic feet of cork, weighing 226lbs. 10oz. and displace 944lbs 8oz. of sea water, leaving 717lbs. 14oz. of buoyancy for a boat twenty-eight feet long, containing twenty-four men."

We are great advocates for simplicity and cheapness; for without those qualifications, the advantages of every invention, however splendid, must be extremely limited. With this simple apparatus of Capt. Gordon's, every boat may, in a few minutes be converted into a Life Boat. It would be an excellent regulation, in our opinion, if in every parish on the sea coasts were to be kept a certain number of these cork buoys, which might be the happy means of saving, annually, thousands of lives. Almost every parish has its fire-engine, to rescue property from the destruction of the flames—why not then some of these simple cheap machines to rescue life from the more devouring watery element?

THE ELEMENTS OF NATURAL PHILOSOPHY.

(Continued from Page 63.)

No. IV.—The Laws of Gravity.

55. All heavy bodies (making a due allowance for the resistance of the air) fall to the surface of the earth with accelerated velocity. And *the spaces described are as the squares of the times of descent*; or, in other words, if the whole time of the falling of any body be divided into any number of equal parts, or instants, whatever be the space through which a body falls in the first instant of time, it will fall three times as far in the second instant, five times as far in the third instant, seven times as far in the fourth, and so in proportion, according to the numbers 1, 3, 7, 9, 11, &c.

56. In order the more clearly to understand this, we must consider that as a body descends, the power of Gravity is constantly and invariably increasing its velocity; the impression which Gravity gives it in the first instant of its fall would alone be sufficient to cause its descent, though it should receive no new impression, but it still operates upon the body, and a new impression is added in the second instant of the fall, which conspires with the first impression and doubles it; and in the third instant the body goes on with the aug-

ment impression and receives also a new one, which triples it; so that every falling body must be supposed to receive, or to acquire, a fresh impression with every succeeding moment, until it ceases by contact or obstruction.

57. So that we may hence deduce the general laws of falling bodies to be,

1. *That in proportion to the times of falling, so are the acquired velocities.*
2. *That the spaces described by a falling body are as the squares of the times, or the squares of the velocities.*
3. *That if a body fall through any space in any time it will require a velocity equal to double that space.*

58. As the motion of bodies falling is uniformly accelerated, or acquiring fresh velocity, so, also, *the motion of bodies thrown upwards is uniformly retarded:* for the same force of Gravity which conspires with the motion of a descending body will act in direct opposition to such as ascend or are projected, retarding that which rises as much as it augments the velocity of that which falls. As the operation of Gravity, therefore, is regular and uniform, in whatever time it generates any velocity in a falling body, in the same time must it destroy that velocity in a rising body.

59. But, in proportion as the rapidity of its descent is increased, the resistance it meets with from the air is increased also; *so that at last the acquired velocity and the increased resistance come to act with equal power; after which the descending body falls with a uniform velocity till it comes to the ground.* If this were not so, a hailstone in its descent from the clouds would strike us with a force nearly equal to a swan-shot from a gun; and the fall of a bulky body be almost equal to the impetus given to a ball by the firing of a cannon.

CHEMISTRY AND THE USEFUL ARTS.

Egyptian Azure.—Sir Humphrey Davy has discovered that this beautiful pigment which has preserved its brilliancy of tint for more than seventeen hundred years, may be easily and cheaply made:—fifteen parts of the carbonate of soda, with twenty of powdered opaque flints, and three of copper filings, when strongly heated together for two hours will produce a substance, which, when powdered, will be of a fine deep sky blue, and closely resemble the Egyptian Azure in tint.

Roman Cement.—By a recent analysis of Parker's Roman Cement, by Monsieur Berthier, he finds that its constituents differ so little from the constituents of chalk and common clay, that he proposes the manufacturing of a similar Cement, by the mere mixture of them in certain proportions:—One part of clay, and two and a half parts of chalk, sets almost instantly, and may therefore be regarded as Roman Cement.

CHEAP BAROMETER.

"*To the Editor of the Register of Arts and Sciences, &c.*

"Sir,

"If a fuller explanation of the 'Cheap Barometer,' than that which was submitted in your last Number, be worthy of attention, I here offer it to you.

"The retention of the water within the phial depends upon the same principles that retain wine, beer, &c. in the tubes used for procuring small quantities from the barrel, viz. partly on external atmospheric pressure, and partly on a want of that pressure, internally, on the contents; which last, being admitted, it is well known, counterbalances the former, and the fluid escapes. This would also be the case were the calibre of the phial's neck too large, as the air being lighter than water would more readily displace it, and ascend to the top of the phial.

"For the dropping of the water when placed before the fire, I assign two reasons, in addition to the one already offered: viz. the expansion of the fluid itself; and that of the air* which all water (not boiled or distilled) contains.

"As regards its dropping in damp weather, air charged with moisture, being lighter than when dry, exerts less pressure, and the balance is destroyed.

"I am, Sir,

"Your obedient Servant,

"*Westminster, Dec.* 8, 1823." "U. P. R."

PERMANENT INK FOR WRITING ON LINEN.—Moisten the cloth with a liquid formed by dissolving one ounce of salt of tartar in two ounces of water, and write with a composition made by dissolving one dram of lunar caustic in two drams of the infusion of galls.

BOOK OF ETERNITY.—In Signior Castagnetta's account of the asbestos we find a scheme for the making of a book, which from its imperishable nature, he is for calling the Book of Eternity. The leaves of this book were to be the asbestos paper, the covers of a thicker sort of the same material, and the whole sewed together with thread spun from the same substance. The things to be commemorated in this book, were to be written in letters of gold, so that the whole matter of the book being incombustible, and everlastingly permanent against the force of all the elements, and subject to no changes from fire, water, or air, must remain for ever, and always preserve the writing committed to it.

* This air is carbonic acid gas; and when water is deprived of it by boiling, or by being placed under the exhausted receiver of an air-pump, it loses its briskness, and is rendered flat and unpalatable.

DOMESTIC ECONOMY.

Preservation of Cabbages.—In the Monthly Magazine for the present month we find the following excellent method adopted by the Portuguese on board their ships :—" The Cabbage is cut so as to leave about two inches or more of the stem attached to it ; after which the pith is scooped out to about the depth of an inch, care being taken not to wound or bruize the rind by this operation. The Cabbages are then suspended by means of a cord, tied round that portion of the stem next the Cabbage, and fastened at regular intervals to a rope run across the deck. That portion of the stem from which the pith is taken, being uppermost, is regularly filled with water every morning. By this simple method the Cabbage is preserved fresh during pretty long voyages."

The same method might be advantageously adopted in private houses.

Musty Flour restored.—Mr. E. Davy of the Cork Institution states, that a small quantity of the carbonate of magnesia will completely take away the unpleasant smell and taste from musty flour. He recommends it to be used in the proportion of thirty grains to one pound of flour. To make bread, it is to be leavened and baked in the usual way, and it will be found much lighter and whiter than when made without it : the bread is much more wholesome and agreeable than when alum is used.

Mildewed Hay and Corn, may be recovered and rendered sweet and agreeable to cattle by the use of common salt. The late Mr. Arthur Young recommends the salt to be used in the proportion of one peck to a load of hay, which is to be strewed upon the hay, in layers, as it is unpacked from the putrid stack. Horses, as well as other cattle, will eat greedily damaged hay that has been salted, which they will not touch without the salt. A solution of common salt sprinkled on corn affected with mildew will completely remove the disease.

Purification of Rooms, Ships, Hospitals.—Into a quantity of common vinegar, throw in powdered whiting or chalk, until it ceases to bubble by the extrication of carbonic acid gas. Allow it to remain until the white powder has subsided, when the supernatent liquor is to be poured off. The white powder is then to be dried and put into a vessel of stone or glass, and sulphuric acid poured upon it as long as the white acid fumes continue to arise. These fumes if condensed into a liquid state would form the acetic acid, or aromatic vinegar of the shops. The facility and cheapness of this process renders it peculiarly useful for the purification of hospitals, ships, prisons, and houses, or wherever contagion may be suspected, as the fumes are very quickly diffused into every part.

It is said that our rectifiers imitate the flavor of brandy by adding a small proportion of nitrous ether to the spirit of malt or molasses.

MISCELLANEOUS ARTICLES.

Moss.—The humble and apparently insignificant Moss is an active agent in some of the most important changes of nature. By its great absorption of moisture, its decay and subsequent revival in succession, the hardest rock, upon which not even a blade of grass could grow, becomes covered in the course of years with a stratum of fertile soil, supporting the most luxuriant trees. At first a little dust is blown into the interstices of the rock, into which are also driven by the winds some of the seeds of the Moss from a less sterile spot. Here they vegetate, and the hitherto naked rock becomes spotted with pretty green tufts; which spreading wider and wider year after year, its whole surface is at length covered with the smiling carpet of Nature. The continual growth and decay of the Moss and other small plants, gradually increase the thickness of the stratum, which renders it capable of supporting larger plants, the seeds of which are borne from all quarters by the weather; the rotting of these plants continue to add to the soil, till at last are seen to flourish the noblest trees of the forest. Thus, the hard and barren rock is made to abound in the richest products and the grandest vegetation: and thus are the sandy heaths and desert plains converted into verdant and fruitful fields. On the tops of the highest hills and mountains the Mosses attract the moisture from the clouds, which trickling through every crevice to find its way to the lowest place, accumulate and form cascades and brooks, which, again uniting, swell into the largest rivers. These waters flowing into the sea are again raised by the influence of the sun's rays, and form clouds, again to be employed in fertilizing and refreshing the earth. Such is the admirable and unceasing process of Nature!

Paper Tree of Japan.—From the bark of the young shoots of this tree the ingenious natives of Japan, manufacture their beautiful glossy paper. By boiling the sticks in water, which occasions them to shrink, the bark is separated from the wood. To make it into paper it is first cleansed from all impurities, then boiled in a clear lye, constantly stirring it, till it becomes so tender that on being touched it easily separates into small fibres. It is afterwards well washed, diluted, and worked about till it becomes of a uniform soft, delicate, woolly substance, and then beaten with sticks till it resembles the pulp of soaked paper. It is then mixed intimately with the gelatinous mucilage of rice and the oreni root, which renders the mixture fit for forming into leaves of paper: to effect this, they make use of moulds made from bulrushes, and the subsequent operations are so similar in principle to our own, that we consider it unnecessary to detail them. This Paper Tree, is the Moras Papyrefera of Linnæus—a species of the mulberry.

Mr. Scoresby's valuable observations on the effects of the sea, at great depths in augmenting the specific gravity of different woods were elicited by a circumstance as singular as it is interesting.

My father, he says, met with the singular instance in the year 1794, which I have taken from his log-book.

On the 31st. of May, the chief mate of the Henrietta struck a whale, which "ran" all the lines out of the boat before assistance arrived, and then dragged the boat under water, the men meanwhile escaping to a piece of ice. When the fish returned to the surface to "blow", it was struck a second time, and soon afterwards killed. The moment it expired it began to sink, which not being a usual circumstance excited some surprise. My father, who was himself assisting at the capture, observing the circumstance, seized a grapnell, fastened a rope to it, threw it over the tail of the fish, and fortunately hooked it. It continued to sink; but the line being held fast in the boat at length stopped it, though not till the "strain" was such that the boat was in danger of sinking. The "bight," or loop of a rope, being then passed round the fish, and allowed to drop below it, inclosed the line belonging to the sunken boat, which was found to be the cause of the phenomenon observed. Immediately the harpoon slipped out of the whale, and was, with the line and boat attached to it on the point of being lost, when it was luckily caught by the encompassing rope. The fish being then relieved from the weight of the lines and boat, rose to the surface, and the strain was transferred to the boat connected with the disengaged harpoon. My father, imagining that the sunken boat was entangled among rocks at the bottom of the sea, and that the action of a current on the line produced the extraordinary stress, proceeded himself to assist in hauling up the boat. The strain upon the line he estimated at not less than three-fourths of a ton, the utmost power of twenty-five men being requisite to overcome the weight. The laborious operation of hauling the line in occupied several hours; the weight continuing nearly the same throughout. The sunken boat which before the accident would have been buoyant, though full of water, when it came to the surface required a boat at each end to keep it from sinking. "When it was hoisted into the ship the paint came off the wood in large sheets; and the planks, which were of wainscot, were so completely soaked in every pore, as if they had lain at the bottom of the sea since the Flood." The boat was rendered useless; even the wood of which it was built, on being offered to the cook as fuel, was tried and rejected as incombustible!

METEOROLOGICAL JOURNAL.

DECEMBER, 1823.

		Thermometer at		
		10 A. M.	4 P. M.	
Monday.....	1	53	54	
Tuesday	2	52	51	Prevailing Wind, S.W. and W.S.W.
Wednesday...	3	46	51	
Thursday	4	47	47	
Friday.....	5	43	46	Weather Cloudy, & generally Cold and Raw.
Saturday	6	43	44	
Sunday	7	42	45	
Monday.....	8	41	47	Foggy and Misty at times.
Tuesday	9	42	45	

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1822, 1823.

SUBSTITUTE FOR TAR.—To the person who shall invent and discover to the Society the best substitute for Stockholm tar, equal in all its properties to the best of that kind, and prepared from materials the produce of the United Kingdom or its Colonies. *The Gold Medal, or One Hundred Guineas.*

N. B.—Tar is produced in Sweden and Norway, from the roots of fir trees burnt for that purpose.

TURPENTINE FROM THE SCOTCH FIR.—To the person who shall prepare in Great Britain the greatest quantity of turpentine, not less than two hundred weight, from that species of fir called Scotch fir, or pinus sylvestris Linn. *The Gold Medal, or Fifty Guineas.* For the next greatest quantity prepared (not less than one hundred weight) *The Silver Medal, or Twenty Guineas.*

N. B.—The Society being in possession of the method practised for extracting turpentine from trees whilst growing, and of samples so procured, information will be given upon that subject, on application for that purpose, at the Society's house.

MACHINE FOR SILK WEAVING.—To the person who shall invent and produce to the Society a machine, to weave figured silks for garments, shawls, handkerchiefs, &c. of patterns equally fine and rich as those now made in France, at less expense than the montures, &c. now in use; also, affording greater facility for changing the pattern, and requiring less manual labour in working. *The Gold Medal, or Fifty Guineas.*

RECENT PATENTS.

ARCHIBALD BUCHANAN, of Glasgow, for an improvement in the construction of weaving looms impelled by machinery. Dated Oct. 1, 1823.

GEORGE HAWKES, of Stepney Old Town, for improvements in ship anchors. Sealed 1st November. Six months.

GEORGE HAWKES, of Stepney Old Town, for improvements in capstans. Sealed 1st November. Six months.

THOMAS HOPPER, of Reading, Berks, for improvements on the manufacture of silk hats. Sealed 2nd November. Six months.

TO CORRESPONDENTS.

As we do not profess that our little work possesses the merits of an universal elixir—good, meet, proper, and calculated for all tastes, wishes, appetites, and inclinations, we are somewhat at a loss to see what point of connection exists between a work on science and a love-song. The verses of Euxis have no doubt much merit, but we must decline their insertion. This is the Register of "Arts," and not of "hearts," as he appears to have imagined.

We thank THOMAS S——— for his offer—from the account of his little invention it seems to be very meritorious; and if he likes to send us a drawing of it (with such other particulars as he can furnish), we will have it engraved, and endeavour to further his interests as much as we can.

Indeed we shall feel much pleasure in receiving communications and drawings of new inventions, and will think it our duty to give every possible publicity and assistance to the exertions of the ingenious, from whatever quarter they may proceed.

"A Friend to the Diffusion of Knowledge" is informed, that a note in answer to his communication is left for him at our Publisher's.

[*To be continued every* FORTNIGHT.]

Printed for and published by GEORGE HEBERT, 88, Cheapside, to whom all Communications (post paid) for the EDITOR are to be addressed—and Sold by SHERWOOD, JONES, & Co. Paternoster Row; and may be had of all Booksellers in Town and Country.

Printed by T. H. Coe, Little Carter Lane, St. Paul's.

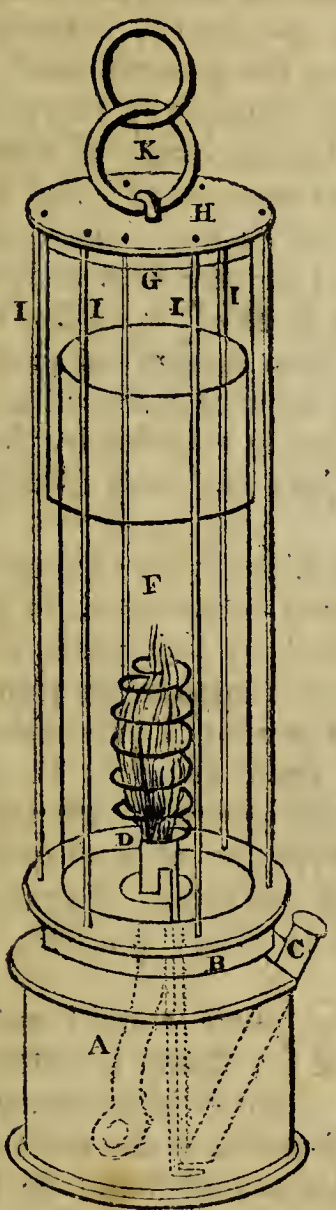
REGISTER

OF

THE ARTS AND SCIENCES,

IMPROVEMENTS & DISCOVERIES.

No. 6.] SATURDAY, DECEMBER 27, 1823. [Price 3*d.*



THE LAMP OF SAFETY.

The above engraving represents a subject which, although much talked of, is very little known, to those whose pursuits in life have prevented the acquirement of knowledge in matters of invention; and we have been induced to give it the more readily, inasmuch as we may thereby be the means of adding to it a slightly more extensive publicity, (among such persons) than it has hitherto (detailedly) acquired.

The gases extricated in mines, (which are destructive to animal life), are of two kinds, and are by the miners called the *choak*

damp, and the *fire damp*; the former consists, for the most part, of carbonic acid gas, hovers about the lower parts of the mine, and extinguishes their lights; and the latter, which is simply hydrogen gas, occupies the superior spaces and involves incalculable mischief, from the combustion produced by its contact with the flame of the miners' candles.

The consequences resulting from the frequent explosion of this inflammable air have been lamentable and tremendous in the highest degree; and, whilst a source of the greatest terror to the persons most intimately affected by its operations, it has excited the deepest sympathy and commiseration in the general mind. To remove an evil, so dreadful in its nature, Sir Humphrey Davy applied his energetic and comprehensive mind, to the discovery of some means by which these saddening calamities might be averted; and how far he has succeeded in this mighty attempt, will be best conceived by the high estimation in which it has been held by the first coal miner* in the kingdom, whose admiration of it is founded upon the certainty of its practical advantages, rather than from theoretical probability.

We do not know that we shall succeed in giving a clearer idea of the nature of the Lamp than is afforded by the language of Ure; who has treated it, and the points relatively consequent upon it, in a very masterly manner.

"In the parts of coal mines where danger was apprehended from fire-damp, miners had been accustomed to guide themselves, or to work, by the light afforded by the sparks of steel struck off from a wheel of flint. But even this apparatus, though much less dangerous than a candle, sometimes produced explosions of the fire damp.

"A perfect security from accident is, however, offered to the miner, in the use of a Safe Lamp, which transmits its light, and is fed with air, through a cylinder of iron or copper wire gauze; and this fine invention has the advantage of requiring no machinery, no philosophical knowledge to direct its use, and is made at a very cheap rate.

"The apertures in the gauze should not be more than 1-20th of an inch square. As the fire-damp is not inflamed by ignited wire, the thickness of the wire is not of importance, but wire from 1-40th to 1-50th of an inch in diameter is the most convenient.

"The cage or cylinder should be made by double joinings, the gauze being folded over in such a manner as to leave no apertures. When it is cylindrical, it should not be more than two inches in diameter; for in larger cylinders the combustion of the fire-damp renders the top inconveniently hot; and a double top is always a proper precaution, fixed $\frac{1}{2}$, or $\frac{3}{4}$ of an inch above the first top.

"The gauze cylinder should be fastened to the Lamp by a screw of four or five turns, and fitted to the screw by a tight ring. All joinings in the Lamp should be made with hard solder; and the security depends upon the circumstance, that no aperture exists in the apparatus, larger than in the wire gauze."

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* John Buddle, Esq.—Vide his Letter to Sir H. Davy; Journal of Science, vol. i. p. 302.

The parts of the Lamp are—A, the brass cistern which contains the oil, pierced near the centre with a vertical narrow tube E, nearly filled with a wire which is recurved above, in the level of the burner, to trim the wick, by acting on the lower end of the wire, with the fingers: it is called the safety trimmer. B, the rim in which the wire gauze cover is fixed, and which is fastened to the cistern by a moveable screw. C, an aperture for supplying oil, fitted with a screw or cork, and which communicates with the bottom of the cistern by a tube; and a central aperture for the wick. D, the burner, or receptacle for the wick, over which is fixed the coil of platinum wire. F, the wire gauze cylinder, which should have less than 625 apertures to the square inch. G, the second top, $\frac{3}{4}$ of an inch above the first, surmounted by a brass or copper plate, to which the rings of suspension are fixed. I, I, I, six thick vertical wires, joining the cistern below to the top plate, and serving as protecting and strengthening pillars round the cage.

When the wire-gauze Safe-Lamp is lighted, and introduced into an atmosphere gradually mixed with fire-damp, the first effect of the fire-damp is to increase the length and size of the flame. When the inflammable gas forms as much as 1-12th of the volume of the air, the cylinder becomes filled with a feeble blue flame, but the flame of the wick appears burning brightly within the blue flame, and the light of the wick augments till the fire-damp increases to $\frac{1}{3}$ or $\frac{1}{4}$, when it is lost in the flame of the fire-damp; which, in this case, fills the cylinder with a pretty strong light. As long as any *explosive* mixture of gas exists in contact with the lamp, so long it will give light; and when it is extinguished, which happens when the foul air constitutes as much as $\frac{1}{3}$ of the volume of the atmosphere, the air is no longer proper for respiration; for though animal life will continue where flame is extinguished, yet it is always with suffering. By fixing a coil of platinum wire above the wick, ignition will continue in the metal when the lamp is itself extinguished; and from the ignited wire the wick may be again re-kindled, on going into a less inflammable atmosphere."

In a letter to the Royal Society, dated Newcastle-upon-Tyne, Sir H. Davy says, "all the Lamps that I have examined, have, at different times been red-hot; and a workman, at the Hepburn Colliery, shewed me a Lamp, which, though it had been in use about sixteen hours a day, for nearly three months, was still in excellent condition; he also said it had been red-hot, sometimes for several hours together. Wherever workmen, however, are exposed to such highly explosive mixtures, double gauze Lamps should be used; or a Lamp in which the circulation of the air is diminished by a tin-plate reflector, placed in the inside; or a cylinder of glass, reaching as high as the double wire, with an aperture in the inside; or slips of Muscovy glass may be placed within the Lamp; and, in this way, the quantity of fire-damp consumed, and consequently of heat produced, may be diminished to any extent. Such Lamps, likewise, may be more easily cleaned, than the simple wire gauze Lamps; for the smoke may be wiped off in an instant, from the tin plate or glass."

"If a blower or strong current of fire-damp is to be approached, double gauze Lamps, or Lamps in which the circulation of the air is interrupted by slips of metal or glass, should be used; or if the single Lamp be employed, it should be put into a commou horn or glass lantern, the door of which may be removed or open."

We understand that another improvement has recently been made, by which its utility will be greatly increased. It consists in attaching a convex lens to the lower part of the wire gauze, which enables the miner to direct a strong light upon any particular part of the mine.

To the above we think it right to add the following account of a very recent improvement.

An unlearned man, but clever mechanic, of the town of Stafford, named George Lovat, is anxious to communicate to his countrymen a scheme for lessening the danger from that dreadful accident the explosion of Fire Damp in coal mines. The remedy which has suggested itself to his mind is the employment of bellows, to be worked by the steam engine. Six or seven pairs of ordinary forge bellows might be required to produce the proper effect. They might be placed one or two hundred yards from the shaft. Atmospheric air is intended to be propelled by a main pipe down the shaft, and thence conducted by smaller pipes, having regulating stop-cocks, to those parts of the mine where the colliers are at work. The stream of air will have force equal to a common current above ground. The Fire-Damp will thus be dislodged from the situation occupied by the miners, or so much diluted as to render it harmless; and ultimately, being lighter than atmospheric air, forced out at the mouth of the pit.

PROFESSOR BORDWINE'S NAUTICAL INSTRUMENT.

This valuable Instrument puts within the reach of every commander of a vessel the solution of that important problem in navigation, viz. the determination of the latitude by two observations of the sun, or other celestial body, taken at any period of the day; and does away with calculation altogether, giving the results in itself. It is formed of four circular arcs (the greatest about nine inches in diameter) having a common centre, and traversing about each other. On two of these are scales for the declination of the object observed, and on the other two scales for the altitudes, which are taken by the usual instruments. There is also a fourth semicircle fixed in position for the time elapsed between the observations. In working it the declination for the first day is set off, the time adjusted, and the verniers marking the observed altitudes brought together, when the instrument will immediately shew the latitude of the place of observation to 15″ of a degree. The distance in time from noon of either observation to 2′ of time; which, compared with a chronometer, will give the difference of longitude. The true azimuth, which, compared with a compass bearing, will give the variation of the magnetic pole.

Fig. 1.

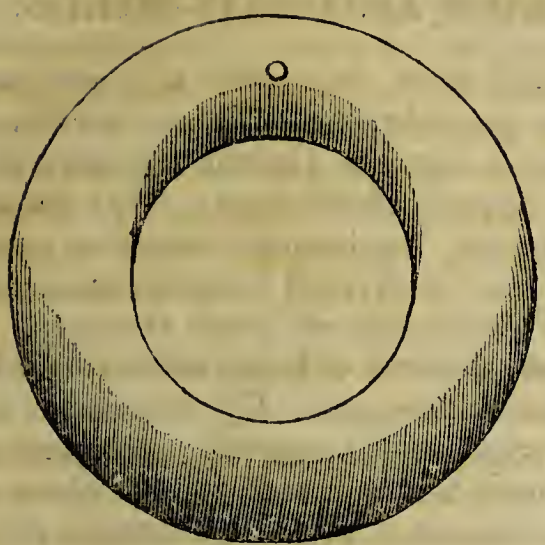
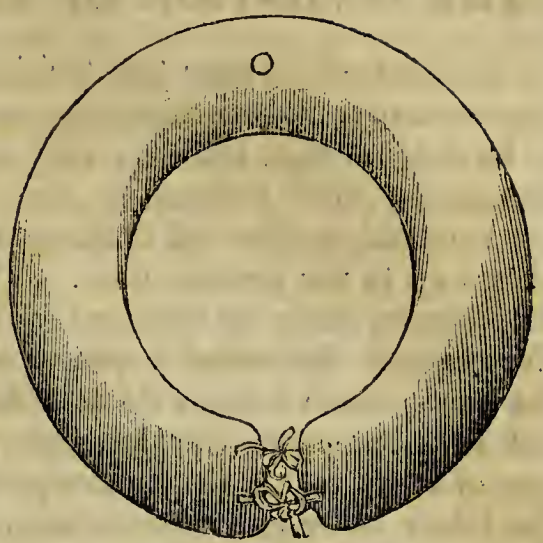


Fig. 2.



SCHEFFER'S LIFE PRESERVER AGAINST DROWNING.

Considering that every invention which may be the means of the saving of life, cannot receive too great publicity, we have not hesitated to introduce the present subject to our readers, notwithstanding it has already been put forth to the public in the form of hand bills; the circulation of which, however, we believe to have been very limited.

**Scheffer's* Life-Preserver unites, in a very eminent degree, the essential qualifications of lightness, portability, and facility of application; and appears to possess, in other respects, a decided superiority over every invention of the kind that has preceded it.

Fig. 1. is the machine inflated with air: it is made of skins, without any seam, is perfectly air tight, and impervious to water. By its cylindrical and circular form it cannot incommode the wearer, by pressing painfully on the breast, nor in the least impede the full action of his limbs; incoveniences to which former inventions subjected the wearer. Its buoyancy is such that it will support two persons in the water at a time without any exertion. It is put on in an instant by a man, by merely stepping into it and passing it up to his chest, where it may be worn without inconvenience; and inflated, if required, in less than a minute of time, by blowing with the mouth into the small hole exhibited in the engraving, which is provided with a stop cock to facilitate the operation: or it may be kept in the pocket ready for any accidental emergency. It would be found extremely convenient to persons desirous of enjoying the delightful recreation of swimming, whether they had previously acquired the art or not, as they could rest themselves at pleasure, in perfect security, over the most frightful depths. At sea, in the dreadful calamity of shipwreck, it would be found a *bosom* friend in *deed*.

Fig. 2. is the Life-Preserver, adapted for women, as it may be tied round them over the clothes.

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* Mr. Scheffer, of No. 1, St. Dunstan's Hill, the ingenious inventor of the Penograph.

THE INVENTION OF SAWS AND SAW-MILLS.

In the earliest ages the trunks of trees were split with wedges, into as many, and as thin pieces as possible; and if it was necessary to have them still thinner, they were hewn or shaved by sharp instruments, until reduced to the required dimensions. This simple yet wasteful method of making boards, has been continued in some places up to the present time. Timber is divided by riving more expeditiously, than by sawing; and the boards are much stronger, as the grain of the wood is preserved, instead of being cut through by the saw, which lessens its cohesion or strength. For this reason an oak rafter or beam that has been sawn is not generally so strong as one of deal, owing to the straightness and uniformity of the fibres of the latter being preserved whole, instead of being cut through as in the irregularly grained oak. The staves of casks are mostly made of split timber, as they can be bent without injury, and are not easily broken by percussion.

The invention of Saws is of very great antiquity; the Greeks placed the inventor in their mythology, among those whom they honoured as the greatest benefactors of mankind. The invention, it is said, originated in the circumstance of the jaw bone of a snake having been employed as an experiment to cut through a small piece of wood, which succeeded so well, that the operator determined to make one of iron. By a painting which is preserved among the ruins of Herculaneum, it is evident that the saws of the Grecian carpenters had the same form, and were made in the like ingenious manner as ours are at present. Two genii are therein represented as at work with a saw, which has a perfect resemblance to our *frame Saw*. In the bench on which the wood is laid, there are a number of holes into which the *cramps* that hold the timber are struck, which are likewise of a similar form to our own, being like the figure 7.

Saw-Mills are likewise of greater antiquity than is generally supposed. So early as the fourth century a Saw-Mill was erected on the small river Roeur in Germany: it is probable, however, that this was but a rude contrivance, as we find writers of more modern times, speaking of Saw-Mills as new and uncommon. The old construction of them had therefore very likely been lost, or the improvement was so great, as to cause the more modern to be looked upon as new inventions.

It cannot, however, be doubted that Saw-Mills have been in use more than four hundred years. Upon the discovery of Madeira in 1420, Mills were erected there for sawing into planks the various excellent timber with which the island abounded. The city of Breslaw had a Saw-Mill in 1427, which produced a yearly rent of three marks. Erfurt had a Saw-Mill in 1490. In Norway the first Saw-Mill was built in 1530. Soon after the first Saw-Mill was built in Holstein, another at Joachimstall. In the year 1555, the Bishop of Ely, ambassador from Queen Mary to the court of Rome, having seen a Saw Mill at Lyons, it was thought worthy of a particular de-

scription. It was not however until the sixteenth century that Saw-Mills received the great improvement of having several different saw blades, by which a piece of timber was cut into many planks at the same time. At Saardam, in Holland, were erected a vast number of Saw-Mills, and it has still a great many, notwithstanding more than a hundred have been given up of late years. The largest Saw-Mill that has perhaps ever been constructed is in Sweden, where a water wheel, twelve feet in breadth, drives no less than seventy-two saws at the same time.

It was not until the seventeenth century that Saw-Mills were introduced into England, attended with the most violent opposition from the sawyers, who apprehended that they would be the means of depriving them of their subsistence. Some that were undertaken were abandoned at the outset, and others were destroyed by the populace.

The Saw-Mills of the present day are of two distinct kinds, the *circular*, those that cut by a continuous rotary motion, and the reciprocating, which operate as the common pit or frame saw. The *circular Saw-Mills* are for the most part used for cutting up timber of small dimensions; and the reciprocating for large timber, in forming beams, rafters, planks, &c. out of large timber. The most important machinery of the kind was erected by Mr. Brunel, at Portsmouth, to whose transcendant genius the mechanical world are indebted for many important inventions and improvements.

MR. EASTMAN's IMPROVED SAW-MILL.

We have now the satisfaction of announcing to our readers, that some highly important improvements have recently been made by Mr. Robert Eastman, of Brunswick Maine, U. S. in Sawing Machines; the principal distinguishing features of which consist in a rotary saw of a novel and far superior construction to the common circular Saw, and in the improved manner in which the logs of wood are sawn.

Instead of a continued series of teeth all round the periphery of the plate like other circular saws, Mr. Eastman's has only eight, or rather it may be said to have only four cutting instruments, (each containing two teeth) which are placed at equal distances on the circumference, and projecting from it; these instruments are called "section teeth." The saving of labour in consequence of this form of Saw, is calculated at full three-fourths, and the surface of the timber is much smoother, than when cut by the full teethed saw. On the saw plate are also fixed instruments called "sappers," which being placed nearer to the centre, do not enter the wood so deeply as the saw, and are adjusted, so as merely to cut off the extraneous sap part, rendering the edges of the planks uniformly straight, and all the cuts of equal dimensions. To understand which, it is, perhaps, necessary here to explain to the reader that the logs are by this machinery cut up lengthwise, *not through the log*, but from the circumference or exterior to the centre, as the radii of a circle; it having been ascertained that planks, staves of casks, &c. cut out in this manner possess much more durability, strength, and elasticity, than by the common method.

MR. EASTMAN's IMPROVED SAW-MILL.

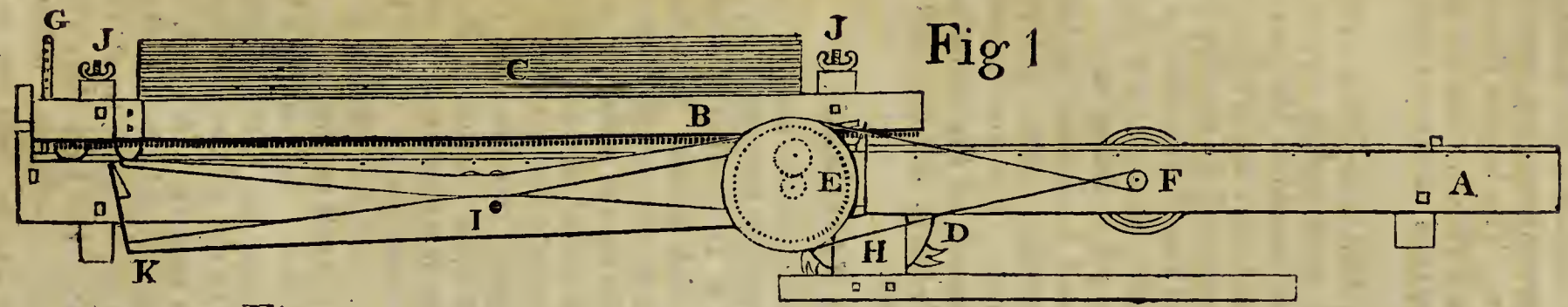

Fig 1

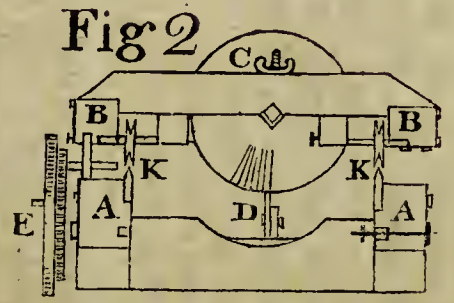

Fig 2

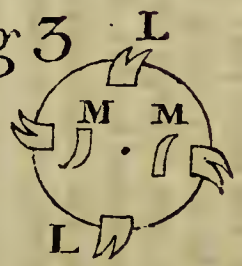

Fig 3

Fig 4

Fig. 1. represents a side view of the machine, with a log in it ready for working. Fig. 2. is an end view of the same, exhibiting the log partly cut into sections. Fig. 3. is the saw, with its section teeth L L L L, and its sappers M M. Fig. 4. shews the shape of the sapper, with a groove, or slit, to admit of its being set according to the intended width of the plank.

A, Fig. 1. is a strong frame of timber, about twenty-four feet long by five broad—the ends of which are seen at A A, Fig. 2. B, Fig. 1. is the carriage, about twelve feet long and four broad, the ends of which are seen at B B, Fig. 2.—it travels upon iron truck wheels, grooved on their circumferences, and run upon iron slides, as shewn at K K, Fig. 2. C, Figs. 1. & 2. gives two views of the log under operation.—The log is fixed into the carriage by means of iron centres, upon which it also revolves after each succeeding cut. At D D, Figs. 1. & 2. is seen part of the saw. At E E, Figs. 1. & 2.

are situated the feed pully and shifting gear. F, regulating pullies. G is an index for regulating the dimensions of the cuts. H, revolving levers and pins. I, the pin and fulcrum of the levers. J J, the stir up screws and pins.

Nearly in the middle of the frame is fixed the *main shaft*, (of cast iron,) which runs upon friction rollers, supported by stands on the floor. On this shaft is the Saw with its *sappers* and *section teeth.* The motion is given by a band passing round the *main pulley*, and round a *drum* that runs under it; which may be driven by horse, steam, or water power. The method by which the saw is fed with the wood to be cut, and the return of the carriage for the succeeding cut is too similar to our own to need a particular description. Its various arrangements are ingeniously contrived, and it may be justly termed a self-acting machine, for when once set in motion, no other aid, than the power which drives it, is requisite to its cutting a whole series of boards of uniform dimensions all round the log, having their thin-edged sides attached to the centre piece. These boards being removed, a second series of boards may be cut in like manner to the former, provided the log is big enough. We subjoin the following remarks by Mr. Eastman upon his own invention.

"This Machine furnishes a new method of manufacturing lumber for various useful purposes. Though the Circular Saw had previously been in operation in this country, and in Europe, for cutting small stuff, it had not, with the knowledge of the writer, been successfully applied to solids of great depth; to effect which, the use of section teeth are almost indispensable.

"In my first attempts to employ the Circular Saw for the purpose of manufacturing clap boards, I used one nearly full of teeth, for cutting five or six inches in depth into fine logs. The operation required a degree of power almost impossible to be obtained with the use of a band; the heat caused the plate to expand, and the saw to warp, or as it is termed, 'to get out of true.' To obviate these difficulties I had recourse to the use of section teeth, and the improvement completely succeeded. The power required to perform a given quantity of work by the other method, was by this diminished at least three quarters. The work, formerly performed by seventy or eighty teeth, was, by the last method, performed by eight teeth; the saw-dust, which before had been reduced to the fineness of meal was coarser, but the surface of the lumber much smoother than when with the full-teethed saw.

"The teeth are made in the form of a hawk's bill, and cut the log up, or from the circumference to the centre. The Saw may be carried by an eight-inch band, when driven a proper speed *(which is from ten to twelve hundred times per minute)*, will cut nine or ten inches in depth into the hardest white oak timber with the greatest ease. The sappers at the same time cut off from one to two inches of the sap, and straighten the thick edges of the lumber.

"The facility with which this Saw will cut into such hard materials, may be supposed to result from the well-established principle, that where two substances in motion come in contact, their respective

action on each other is in direct proportion to their respective velocities; thus a circular plate of iron put into a quick rotary motion, will with great ease penetrate hardened steel, or cut through a file when applied to its circumference; and the same principle is applicable to a saw for cutting wood. The requisite degree of velocity is obtained by the continuous motion of the Circular Saw; by which also it has greatly the advantage of one that has but a slow motion on account of dulling, as the teeth are but little affected, and being only eight in number, but a few moments labour is required to sharpen them. If the velocity of the Saw were slackened to a speed of but forty or fifty times per minute, it would require at least four such bands to carry it through a log as above described.

"One machine will cut from eighteen to twenty hundred of square feet of pine timber per day, and two of them may be driven by a common tub wheel, seven or eight feet in diameter, having six or seven feet head of water, with a cog wheel and trundle head, so highly geared as to give a quick motion to the drums, which should be about four feet in diameter. The Machine is so constructed as to manufacture lumber from four to ten feet in length, and from two to ten inches in width, and of any thickness. It has been introduced into most of the New England States, and has given perfect satisfaction. The superiority of the lumber has for three years past been sufficiently proved in this town, (Brunswick Maine) where there have been annually erected from fifteen to twenty wooden buildings, and for covering the walls of which this kind has been almost universally used. The principal cause of its superiority to Mill-sawed lumber, is in the manner in which it is manufactured, viz. in being cut towards the centre of the log, like the radii of a circle; this leaves the lumber feather-edged in the exact shape in which it should be, to set close on a building, and is the only way of the grain, in which weather boards of any kind can be manufactured to withstand the influence of the weather, without shrinking, swelling, or warping off the building. Staves and heading also, must be rived the same way of the grain, in order to pass inspection. The Mill-sawed lumber, which, I believe, is now universally used in the Middle and Southern States, and in the West Indies, for covering the walls of wooden buildings, is partly cut in a wrong direction of the grain, which is the cause of its cracking and warping off, and of the early decay of the buildings by the admission of moisture. That such is the operation may be inferred by examining a stick of timber which has been exposed to the weather; the cracks caused by its shrinking all tend towards the heart or centre, which proves that the shrinking is directly the other way of the grain. It follows that lumber cut through or across the cracks, would not stand the weather in a sound state, in any degree to be compared with that which is cut in the same direction with them. I have no hesitation in stating that one half the quantity of lumber manufactured in this way, will cover and keep tight and sound the same number of buildings for an hundred years, that is now used and consumed in fifty years. Add to this the reduction of expence in transportation, and of labour in putting it on, and

I think every one must be convinced that the lumber manufactured in this improved way is entitled to the preference.

"In manufacturing staves and heading a great saving is made in the timber, particularly as to heading, of which at least double the quantity may be obtained by this mode of sawing, to what can be procured in the old method of riving it; nor is the straight grained, or good rift indispensable for the saw as it is for the purpose of being rived. The heading when sawed, is in the form it should be, before it is rounded and dowelled together, all the dressing required being merely to smooth off the outsides with a plane. Timber for staves ought to be straight in order to truss, but may be manufactured so exact in size, as to require but little labour to fit them for setting up.

"Both articles are much lighter for transportation, being nearly divested of superfluous timber, and may be cut to any thickness required, for either pipes, hogsheads, or flour barrels."

SUPERIORITY OF AMERICAN FLOUR MILLS.

"Baltimore is celebrated for the fineness of its flour; the superiority of which arises from the perfection at which they have arrived in the machinery by which it is manufactured. I have recently visited a mill driven by steam, in which manual labour is so completely excluded, that the sailor, who delivers the grain at the wharf, is the last person who applies his hand to it, till it descends into the barrel in the shape of superfine flour. It is difficult to convey a proper idea of machinery without the aid of drawings, but I trust you will be able to comprehend the following rude outline of the process. A covered trough, which projects from the mill to the end of the wharf, receives the grain as it is emptied from the vessel; within this trough is an axle revolving longitudinally, around which are thin pieces of wood projecting into the trough, and continued along in a spiral line. As the revolution of the screw of Archimedes raises water, so this axle, by revolving among the grain, forces it backward in a regular current from the wharf to the mill. The grain on reaching the inner end of this trough is received into a succession of little buckets, which are strung upon an endless belt revolving upon two wheels, the highest of which is in the garret floor. As these buckets turn over the upper wheel, they empty their contents into a box, from which the grain is conveyed to the fanners, where it is thoroughly cleaned. From the fanners it is conducted into the hoppers in the floor below; here eight pair of stones are kept constantly at work. From the stone the flour descends into a long wooden trough, similar to that into which the grain was first thrown; and another spiral screw, revolving here, urges it gradually forward to another series of buckets, which carry it to an upper story, and discharge it into a machine for cooling it. This consists of a spindle revolving perpendicularly, with a horizontal shaft crossing it near the floor, in the under part of which are teeth, formed of thin slips of wood which nearly touch the floor, and which are so disposed in

relation to each other, that while they stir the flour round, they at the same time convey it inwards towards the centre. The flour is thus spread thinly over the floor; and as the teeth revolve among it, it describes circles successively smaller and smaller, until it falls through an opening into the bolting machines in the story below. Here are three bolting cylinders, producing the various degrees of common, fine, and superfine flour; and from them it is finally received into barrels, ready for inspection and shipping. This mill manufactures, with ease, a thousand bushels a day; and the flour which it produces always commands an advance on the average market-price."

Duncan's Travels in America.

THE ELEMENTS OF NATURAL PHILOSOPHY.

(Continued from Page 75.)

No. V.—Of Central Forces.

60. There is no impelling force whatever which can make a body describe a curve line; all propelled bodies, therefore, would continue to move in a straight line, were it not for the attraction of gravity.

61. If an impelled body move in the circumference of a circle, it is attracted towards the centre of the circle by a force which is acting upon it during the whole time of its motion: for in every part of the circumference the revolving body forsakes the right line in its present direction, and approaches towards the centre of the circle.

To illustrate this: if a body be attached to a string, and so revolve round the hand, it will continue to do so until the body be loosed; it will then fly off in a tangent, or straight line, to that point of the circumference in which the body happens at that moment to be.

62. Four things will here be to be considered.

1. The original impulse of the body.
2. Its continual attraction to the centre, which draws it away from moving in a right line, termed the *centripetal force.*
3. Its constant tendency to fly off in a tangent, arising from the continuance of the original impulse or projectile force.—and,
4. The force which balances the attraction, and prevents the body from falling to the centre, called the *centrifugal force.*

63. These forces are called *central forces.*

64. The *centripetal* and the *centrifugal forces* are always and invariably equal, for they act in contrary directions, and each destroys the effect of the other; so that the body neither flies off, nor falls inwards, but moves on in its proper orbit.

65. If the attraction continue the same, whilst the centrifugal force becomes greater, the revolving body will recede from the centre; but if the attraction continue the same, and the centrifugal force becomes less, the revolving body will approach towards the centre. If the attraction entirely cease, the body will fly off in a tangent—

and if the projectile force be quite destroyed, the body must fly in a direct line towards the centre, from the cessation of the centrifugal force.

66. The following theorems, concerning central forces, are provable by experiment, and geometrically demonstrable.

1. "*If two bodies revolve around different centres, and if the distances and periodic times be equal, the centrifugal forces will be as the quantities of matter in the revolving bodies.*
2. "*If the quantities of matter and the times are equal, the centrifugal forces will be as the distances.*
3. "*If the quantities of matter and the times are equal, the centrifugal forces will be as the squares of the times reciprocally, or as the squares of the velocities directly.*
4. "*If the quantities of matter and the velocities are equal; the centripetal forces will be as the distances reciprocally.*
5. "*So that if the quantities of matter are equal, the centripetal forces will be in the compound ratio of the distances reciprocally, and the squares of the velocities directly.*"

CHEMISTRY AND MISCELLANEOUS ARTICLES.

Gas, from Pyroligneous Acid.—It has lately been discovered that when wood acid is made to pass through an iron tube heated to bright ignition, and the acid allowed to enter the tube by drops in quick succession, gas, of a very excellent quality, is obtained. This fact was first observed by Mr. Leet, of this city, whilst pursuing experiments on the purification of pyroligneous acid.—*Chester Paper.*

Mixture of Colourless Liquids producing a Black.—One of the most interesting phenomena in the operations of chemistry, occurs in the decomposition of the sulphate of iron by the gallic acid. Into a wine glass, containing the infusion of galls, pour a solution of the sulphate of iron. The gallic acid, from its superior elective affinity to the iron, detaches it from its former combination with the sulphuric acid, and in a short time, these two fluids, previously colourless, become intensely black. To make this black fluid into ink, nothing but a little gum is required to retard the precipitation of the feculae.

Experiments on Human Hair.—M. Vauguelin, the celebrated French chemist, discovered from some experiments which he made, that black hair is formed of nine different substances, viz. animal matter, a white concrete oil, another greenish grey, one which is very abundant, iron, some particles of oxide of manganese, a phosphate of lime, carbonate of lime, silex, and a considerable quantity of sulphur. Red hair contains red oil in place of a greenish black

kind; and white, or very light hair, differs from all the others, as the oil is nearly colourless, and it contains some phosphate of magnesia, which is not found in the others.

Theory of Dyeing.—The preceding account of the experiments of M. Vauguelin on the construction and colour of human hair, leads us to notice that the colour of dyed stuffs, silk, cotton, or woollen, is owing, also, to the reflection of the colouring matter contained in their transparent tubes. The fibres of these materials are found to be minute tubes, containing peculiar liquids, mostly of an oily nature. This oily, or other matter, is extracted in the preparatory processes of dyeing, by the use of alkalies and acids; or it is converted, by the different mordants employed, into other substances, better adapted to the contact of the colouring matter, which is afterwards introduced into the tubes in the dye bath.

Congelation of Mercury.—M. Gay Lussac states, in a Memoir on the Cold produced by the Evaporation of Fluids, that he has readily frozen Mercury, by surrounding it with a frigorific mixture of ice and salt, in the apparatus in which aqueous vapour is produced by the process of Mr. Leslie; and he has no doubt, with analagous means and very vapourable liquids, a degree of cold might be produced below that caused by mixtures.

New Solar Theory.—Dr. Hoyer, of Minden, has published in the Sunday Journal of that town, a detailed account of his hypothesis, that the Nucleus of the Sun consists of molten gold.

African mode of cooking an Ostrich's Egg.—A small hole, the size of a finger, is very dexterously made, and having cut a forked stick from the bushes, they introduce it into the egg, by pressing the two prongs close together; then by twirling the ends of the stick, between the palms of the hands, for a short time, they completely mix the yolk and the white; setting it upon the fire, they continue frequently to turn the stick, until the inside has acquired the proper consistence of a boiled egg. This method recommends itself to a traveller by its expedition, cleanliness, and simplicity; and by requiring neither pot nor water; the shell answering perfectly the purpose of the first, and the liquid nature of its contents that of the other. Notwithstanding the enormous size of one of these eggs, being fully equal to twenty-four of our domestic hen, the Hottentots commonly eat a whole one at a time.—(*Mr. Burchell's Travels in the Interior of Southern Africa.*)

Star Fish.—The most extraordinary of this tribe is the Medusa's Head Star Fish of Linnæus, called by some writers, Stella Arborescens. It grows to a great size, measuring full two feet in diameter when the limbs are extended. It is first divided into five equi-distant, jointed processes, each of which is soon subdivided into two other smaller ones; and each of these at a somewhat further distance, into two others, still smaller; this mode of regular subdivision, being continued to a vast extent, and in the most beautiful gradations of minuteness, till at length the number of extreme ramifications amounts to several thousands. By this most curious structure the animal

becomes, as it were, a kind of living net; and is capable of catching such creatures as are destined for its prey, by the sudden contraction of all its innumerable ramifications, and thus the object is secured beyond all power of escape. Examples of this animal, well worthy of notice, may be seen in the British Museum.

Paper Nautilus.—"Among the principal miracles of nature," says Pliny, "is the animal called Nautilus, or Pompilos. It ascends to the surface of the sea in a supine posture, and gradually raising itself up, forces out, by means of its tube, all the water from the shell, in order that it may swim the more readily; then throwing back the two foremost arms, it displays between them a membrane of wonderful tenacity, which acts as a sail, while with the remaining arms it rows itself along, the tail in the middle acting as a helm to direct its course, and thus it pursues its voyage; and if alarmed at any appearance of danger, takes in the water and descends."

The Lantern of Maracaybo—This luminous phenomenon is seen every night on a mountainous and uninhabited spot on the borders of the river Catatumbo, near its junction with the Salia. Being nearly in the meridian of the opening of the lake of Maracaybo, navigators are guided by it as by a lighthouse. This light is distinguished at a greater distance than forty leagues! Some have ascribed it to the effects of a thunder storm, or of electrical explosions, which might take place daily in a pass in the mountains, while others pretend that it is an *air-volcano*. M. Palacios observed it for two years at Merida. Hydrogen gas is disengaged from the ground in the same district; this gas is constantly accumulated in the upper part of the cavern *Del serrito de Monai*, where it is generally set on fire to surprise travellers.

Venom of the Bee—It is not, probably, generally known that the venom of the bee bears a close resemblance to that of the viper. It is contained in a small vesicle and has a hot and acrid taste like that of the scorpion.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce—Session 1822, 1823.

TRANSPARENT PAPER.—To the person who shall discover to the Society a method of making paper from the pulp, that shall be perfectly transparent, and that shall take and bear common writing ink with the same facility and correctness as writing paper generally in use. The Silver Medal, or Twenty Guineas.

PREPARATION OF SULPHURIC ACID.—To the person who shall prepare the largest quantity (not less than one ton) of sulphuric acid from sulphur, without any nitric salt, of a specific gravity not inferior to the best sulphuric acid of commerce.—The Gold Medal, or Fifty Guineas.

PREVENTING THE MILDEW IN PAPER.—To the person who shall communicate to the Society a process to be used in the manufacture of paper, or some application to be made to manufactured paper, which shall effectually prevent it from becoming mildewed.—The Gold Medal, or Thirty Guineas.

IMPROVED BLACK DYE FOR SILK OR WOOL.—To the person who shall invent and discover to the Society a black dye for silk or wool, superior in colour and durability to any at present in use.—The Gold Medal, or Fifty Guineas.

EXTINGUISHING FIRES.—To the person who shall produce to the Society a method for preventing or extinguishing fire in buildings, superior to any now in use. The Gold Medal, or Thirty Guineas.

RECENT PATENTS.

JOHN DAY, of Barnstaple, Devonshire, Esq. for certain improvements on percussion gun-locks, applicable to various descriptions of fire arms.—Dated Nov. 13, 1823.

SAMUEL SHERVILL, of Brown's Hill, Bisley, Gloucestershire, clothier; for a mode or improvement for dressing of woollen or other cloths.—Dated Nov. 13, 1823.

JOHN HEATHCOTE, of Tiverton, Devon, lace manufacturer; for a machine for the manufacture of a plaited substance, composed of either silk, cotton, or other thread or yarn.—Dated Nov. 20, 1823.

ANTHONY DEANE, of Charles Street, Deptford, Kent, ship caulker; for an apparatus or machine to be worn by persons entering rooms or other places filled with smoke or other vapour, for the purpose of extinguishing fire, or extricating persons or property therefrom.—Dated Nov. 20, 1823.

TO OUR READERS AND CORRESPONDENTS.

THE account of Mr. T's invention will appear in our next, the engraving is executed.

B's obliging communication we are necessitated to postpone the insertion of, until the next number.

Tabitha will find the information she seeks in our present number.

Could not some kind orthoepist do us the favour to manufacture a few more alphabetical signs? We have letters of all sizes and kinds before us, but all ringing the same changes, backwards, forwards, transversely, obliquely, remotely, down the middle and up again from Z to A, and A to Z. We dare not give an affirmative to one A. B. because there is another A. B. whom we must answer in direct negative; and a third A. B. asks a question, that we are at a loss to know whether he should have yea or nay. We therefore say

To A. B. the first, Yes!
To A. B. the second, No!!
To A. B. the third, we don't know!!!

and must leave their ingenuity to determine the order of priority.

IT is now that season of the year in which the general body corporate of the world relaxeth from the severity of its multitudinous functions, and indulgeth more in feasting than philosophy. Good people, from some unaccountable reason discard at Christmas all ideas of theoretical wisdom: they have an eye to the practical illustrations of the family dinner, and are prone to plumb-pudding. It were invidious to be sapient at such a time; one would be laughed at for his pains. Steam is assuredly a fine thing, and will work wonders mighty and marvellous; but heed it nothing: contemplate a twelve-horse engine and the pot upon the kitchen fire! Oh what a *vessel* is that! What a generator! Talk not of safety valves and suction pipes, it maketh a man conscious of the hollow cylinder—the condenser—and the throttle-valve *within*—the forcing pump which passeth shew! Yea it evolveth a plenitude of appetite! Who was he of old whose brain projected the goodly Christmas pudding, huge, comely, and rotund? In what annals hath his name been writ? Man of glorious memory! His patent hath it not been sealed by the universal voice?—his specification hath it not been discussed of nations?

It may be complained that this subject savoureth of irrelevancy, and cometh not within the precincts of our labours, but we crave pardon; right savoury do we think it and meet for well appointed cogitation; and very truly do we hope that our gentle friends will have the cause, the occasion, and the power, to experiment upon it with honour to themselves, and credit to the cook.

Happy and hilarious be your cheer, Sirs, and a merry Christmas to ye all!

[*To be continued every* FORTNIGHT.]

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IMPROVEMENTS & DISCOVERIES.

No. 7.] SATURDAY, JANUARY 10, 1824. [Price 3*d*.

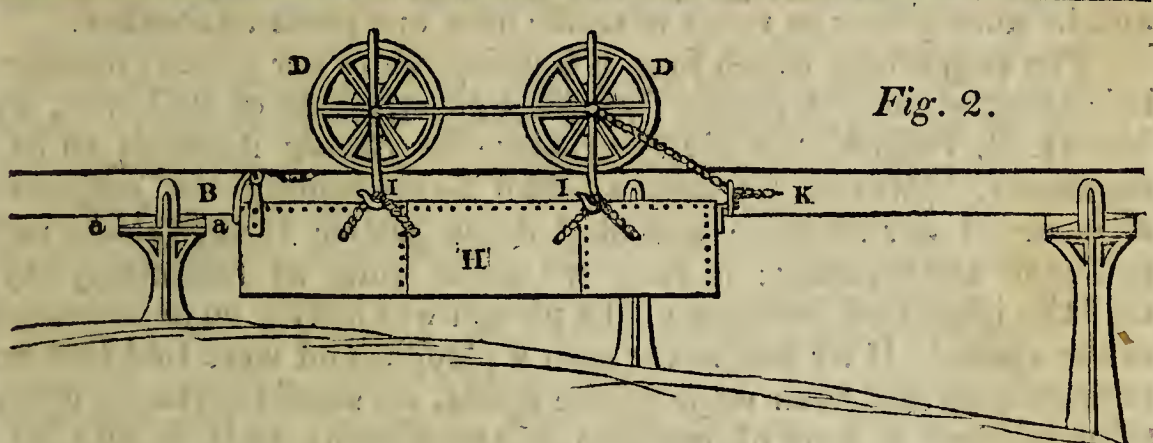


Fig. 2.

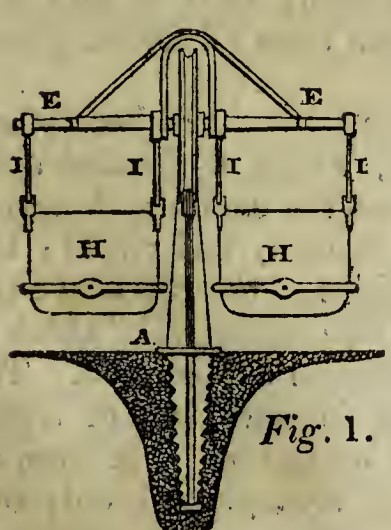


Fig. 1.

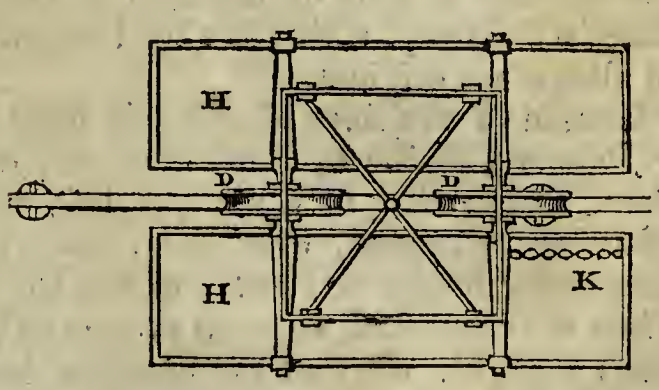


Fig. 3.

MR. H. R. PALMER's IRON RAIL-WAY.

MR. PALMER'S IRON RAIL-WAY.

The origin of Rail-ways may be traced back as far as the year 1680. About this time coal came generally into use as a substitute for wood fuel in London and other places; in consequence, the greatest inconvenience accrued at the mines in conveying the coals from them to the ships, and the expense of horses and machinery for the purpose was immense. To facilitate the travelling of the waggons over the dilapidated roads, wooden rails or straight pieces of wood were laid down and imbedded in the road, which were afterwards improved upon by making ledges upon their sides, to prevent the waggons from going out of their track. By these simple contrivances it was also found that a waggon which required previously three or four horses to draw it, was with greater facility drawn by one horse, and in much less time, as the rails were laid upon a gradual descent. These wooden Rail-roads had been generally in use for fifty years, when cast-iron was introduced as a substitute, about the year 1738; but a difficulty arose in the great pressure of the heavy waggons then in use upon the iron, which was subsequently overcome, by reducing the size of the waggons and linking a number of them together in a team, by which means the pressure was extended over a larger surface. The importance of Rail-roads becoming every year more manifest, several able treatises on the subject, from distinguished scientific men, appeared towards the close of the last century, setting forth their utility, and proposing plans for their improvement. After this time iron Rail-roads began to be constructed as branches to canals, and in some places as roads of traffic from one place to another.

The engravings which form a frontispiece to our present number, is in illustration of a greatly-improved construction of Rail-way, by Mr. H. R. Palmer, the civil engineer; in calling it merely an *improvement*, however, we fear, we shall be misleading the judgment of some of our readers; and omit doing justice to the talents and genius of the inventor: in fact, we might quite as reasonably say, that the important *invention* of the plough was merely an *improvement* of the spade. If we had never seen a plough, and were told that an improvement had been made on the spade, we should certainly never think of such a form of machine as the plough; so it is with Mr. Palmer's Rail-way, which is a bold innovation upon all former plans, and altogether original.

Instead of *two* lines of rail laid upon the ground, as heretofore, Mr. Palmer's Rail-way consists of only *one*, which is elevated upon pillars, and carried in a straight line across the country, however undulating or rugged, over hills, valleys, brooks, and rivers; the pillars being longer or shorter to suit the height of the rail above the surface of the ground, so as to preserve the line of the rail, which is always straight, whether the plane be horizontal or inclined. The waggons or receptacles for the goods, travel in pairs, one of a pair being on one side of the rail, and the other on the opposite side, as panniers over the back of an ass. By this arrangement only two wheels are employed (instead of eight) to convey a pair of waggons;

these two wheels are placed one before the other on the rail, and the axletrees upon which they revolve, are made of sufficient length and strength to form extended arms of support, to which are suspended the waggons or receptacles on each side of the rail, *the centre of gravity being always below the surface of the rail.* The rods by which the waggons are suspended are inflexible; hence, although the weights on each side be not equal, they will nevertheless be in equilibrio; as may be observed in a ship, which being unequally loaded, it assumes such an angle with the surface of the water as preserves the equilibrium. Although an equal distribution of the load on both sides be preferable, it is not necessary.

A number of the carriages are linked together, and towed along the rail by a horse, as barges on a canal. Owing to the undulation of the country the horse will sometimes be much below the rail, in consequence of which he is provided with a sufficient length of rope, to preserve a proper angle of draught.

Fig. 1. is an end view of the carriage, with a cross section of the rail, and of a pillar shewing its form, and manner of fixing. *Fig.* 2. is a side view of the Rail-way passing over an uneven surface, with three of the supporting pillars of unequal length. Upon the upper surface of the rail, are seen the two carriage wheels, and the manner of suspending the waggons or receptacles from the axletrees, which is, however, better shewn by *Fig.* 1, letters I, I, I, I, (the same letters refer to the same parts in the different figures.) *Fig.* 3. is a plan of the same, in which the comparative measurements are clearly shewn, and the mode by which the receptacles are braced together.

A, *Fig.* 1. is an upright pillar of cast iron, having at the shoulder a flanch which rests upon the surface of the ground. The pillar is formed with ribs at right angles, which converge toward the lower extremity, and are notched on the edges for the better securing it firmly in the ground, with the broken hard materials which are rammed around it; the hole into which it is inserted being previously well prepared by ramming with a sort of pile driving engine. Three of these pillars are seen at *Fig.* 2. which are placed at about nine feet apart. At the upper extremity of the pillars are long clefts or openings to receive the rail B, which is composed of deal planks set on their edges, with the upper surface C, defended by cast or wrought iron plates, a little convex on the upper side.

When the rail has been some time in use, and all has taken the proper bearing, a little adjustment of the line may be requisite, before the rail is bolted to the pillars; to effect which a very simple and easy method is provided. In the cleft of the pillars, and under the rail, two wedges, a a, are introduced, whereby its level may be adjusted with the nicest accuracy.

D D are the wheels, which are provided with flanches on their peripheries to keep them from travelling off the rail. E E are the arms or axles, H H are the receptacles for the goods, which are represented as made of plate iron, and are suspended to the arms or axles, (as before mentioned) by the inflexible rods I I I I. To one of the arms a chain K is hooked, to which a towing rope may be con-

nected. Any number of carriages may then be attached together by chains hooked on to the angles.

The frontispiece is intended to exhibit a portion of the Rail-way in use, and the methods by which several of the obstacles which frequently present themselves are overcome. On the left is seen a jointed rail or gate, which crosses the road; over which the train of carriages have just passed and the gate swung back to leave the road open. The horse and man having just forded the brook, the train of carriages are proceeding in their course, and following another train part of which is seen on the right crossing the rail bridge, which is simply constructed for that purpose. Provision is made for trains of carriages that are proceeding in opposite directions by means of "sidings" or passing places.

With respect to loading; if both receptacles be not loaded at the same time, that which is to be loaded first must be supported until the second is full. Where there is a permanent loading place, the carriage is brought over a step or block; but when it is loaded promiscuously, it is provided with a support connected with it, which is turned up when not in use. From the small height of the carriage, the loading of those articles which are done by hand becomes less laborious.

The unloading may be done in various ways, according to the substance which is to be discharged; the receptacles being made to open at the bottom, the sides, or the ends: in some cases it may be desirable to suspend them by their ends, when turning on their own centres they are easily discharged sideways.

Among the principal advantages that result from the adoption of Mr. Palmer's plan, may be mentioned, that of enabling the engineer, in most cases, to construct a Rail-way on that plane which is most effectual, and where the shape of the country would occasion too great an expenditure on former plans; that of being maintained in a perfectly straight line, and in the facility with which it may be always adjusted; in being unencumbered with extraneous substances lying upon it; in receiving no interruption by snow, as the little that may lodge on the rail, is cleared off by merely fixing a brush before the first carriage in the train; in the facility with which the loads may be transferred from the Rail-way on to other carriages, by merely unhooking the receptacles, without displacing the goods, or from other carriages to the Rail-way by the reverse operation; in the preservation of the articles conveyed from being fractured, owing to the uniform gliding motion of the carriages; in occupying less land than any other Rail-way; in requiring no levelling or road-making; in adapting itself to all situations, as it may be constructed on the side of any public road; on the waste and irregular margins of rivers; on the beach or shingles of the sea shore; indeed, where no other road can be made; in the original cost not being much less, and the impediments and great expense occasioned by repairs in the ordinary mode, being by this method almost wholly avoided, &c. &c.

In conclusion, we think it due to the ingenious inventor of this Rail-way to state, (it having been proved by actual experiment) that

in the best Rail-road on the old plan in the kingdom, the amount of resistance in a *straight line* is equal to the 170th part of the whole weight of the carriages and their contents, and that the resistance on Mr. Palmer's Rail-way is only the 300th part; that on the former an average good horse will draw at the rate of two and a half miles per hour, throughout the day, 25,500 pounds weight, and that the same force employed upon Mr. Palmer's will draw 45,000 pounds weight.*

We regret that the limits of our publication will not permit us to go more at length into this interesting subject; we can, however, refer our readers to an elegant little work from the pen of Mr. H. R. Palmer, (and published by Mr. Taylor, of the Architectural Library in High Holborn), in which, besides giving an account of his own admirable invention, he discusses the subject of Rail-ways generally, evincing throughout such an intimate knowledge of the principles of mechanical science, as must place him in the foremost rank of civil engineers.

POWER OF HORSES, IN CARRYING AND DRAWING BURTHENS.

The energy of some of our racers, for a short effort, is prodigious; the famous race Horse Childers is stated to have run a mile a minute, with a weight of seventy-three pounds; and it was equal to continue this speed for ten miles. An ordinary racer, with about the same weight, clears from twenty to twenty-one feet at each leap.

Horses can exert a great deal more force in carrying than in pulling. A horse walking at the rate of two miles an hour, cannot draw a greater weight over a pulley than 200 pounds avoirdupoise; at a speed of three miles an hour, he cannot draw more than 130 pounds; nor can he continue his speed for a whole day with a greater draught than about 100 pounds. This draught must be diminished to sixty or seventy pounds when the pace is four miles an hour, he should not draw along with him more than a weight of forty pounds.

By placing the burthen on his back, we see that a Horse will perform five or six times more labour than if the load were placed so that he must draw it horizontally over a pulley, or on a sledge, or than is exerted in the action of ploughing. Two horses cannot exert a greater force in drawing a plough than 150 pounds, equal to seventy-five pounds each horse, and move at the rate of two miles an hour. But, by the mechanical effect of the wheels in diminishing friction, a Horse can draw in a cart a load fourteen times greater than he can do when he is harnessed to a sledge or in a plough. The carriers between Glasgow and Edinburgh use two-wheel single horse carts, which weigh from 700 to 800 pounds, and the load of goods weighs 2000 pound additional. With this load a Horse travels twenty-two miles a day. The London dray horses are capable of powerful temporary exertion; but the average of their labour is less than that of the lighter breeds in the country; much of their force is expended in

* A specimen of Mr. Palmer's Rail-way may be seen at Mr. Smart's, Pedlar's Acre, near Westminster Bridge.

moving their ponderous mass. In 1805, a cart horse was exhibited which measured nineteen and three quarter hands high, six feet, seven inches. It was sixteen feet five inches long, and eight feet two inches in girth, but all its movements were sluggish. It was bred at Denham, in Middlesex.

CHEAP VAPOUR BATH.

To the Editor of the Register of Arts and Sciences, &c.

"SIR,

"As I hope you will not think that any thing which can be useful or agreeable should be despised and rejected for its simplicity, I venture to inform you of the means which I have employed to procure (what has always been to me a source of great enjoyment) the Vapour Bath.

"I believe that this powerful yet safe agent would be very frequently employed by medical men, if the means for the application of it were at hand when wanted (though at present but little understood,) but it most frequently happens, that when wanted the baths cannot be brought to the patient, and the patient is too unwell to be moved to the bath.

"Some time since I read Dr. Arthur Clarke's Essay on Bathing, and I felt extremely desirous of enjoying the luxury and advantages of a Vapour Bath; many things suggested themselves to me as very proper for making the covering for the kind of tent which I proposed to use. Blankets were, I conceived, probably thick enough, and were bad conductors of heat, but when heated in any way they had a disagreeable smell, and I rejected them; twilled calico would be better; but it would be very dark inside, and I wished it to be at least light enough for me to read the thermometer when in the bath. It struck me that I might try paper for the experiment, I did try it, and found that it would resist the steam certainly to a greater heat than I should ever require in the Bath, and that when taken down the heat it had acquired from the steam readily dried it; of this any of your readers may convince themselves by tying a paper bag over the spout of a tea kettle; encouraged by the result of this simple experiment I made myself a Bath, I have very frequently used it, and it is still in use; if any rent occurs, which in so slight a material may be expected, it is of little consequence, where a slip of paper and some paste will repair the damage. I need not give a minute description of the tent I use, but I would recommend that it should be made double, and that the two coverings should not be pasted together, except at the top and bottom edges where a slip of linen may be pasted between to strengthen it; but an interstice should be left between the sheets, which will more effectually prevent the transmission of the heat, and the consequent condensation of the steam; the paper most proper for this purpose is the largest kind of sized paper, called double crown, a tent four feet in diameter and six feet in height will give ample room for a chair inside; a hoop made of tinned iron wire of the thickness of a quill should be suspended by tapes, on which

the top of the tent should be pasted, and the covering of the tent should be sewn at the edge to the hoop, which will keep it extended; where the height of the room will admit of it the tent may be raised or lowered by means of a string passing over a pulley; if otherwise, it may be suspended so that the lower edge shall touch the floor and the sides may be raised to admit the bather.

"The boiler is a tin saucepan with the lid soldered on, with a hole in the middle to receive a bung which is perforated to admit the steam pipe which wedges into it. I did not succeed in my first experiments with the boiler, but the workman whom I employed, Mr. Saunders, of Tabernacle Square, City Road, suggested such improvements as caused it to exceed my expectations. A four quart boiler is large enough, but it should never be above three parts full, and the heat of a common fire is rarely sufficient without the assistance of bellows; the steam pipe should be about half an inch in diameter, and the angle of the elbow of the pipe should be regulated by the height of the fire place, and the distance at which the Bath is to be hung, so that the end of it may rest upon the floor just within the nearest edge of the tent; the expense of the tent, boiler, and pipe, will not exceed ten shillings.

"In conclusion, allow me to remark that the Vapour Bath is known as an enjoyment and a remedy by the luxurious inhabitants of the East, and that it is more valued as a stimulant by the hardy natives of the North, by whom it is invariably used as a restorative after excessive fatigue: there is yet one objection which is frequently urged, which is, that after bathing the body must be particularly liable to take cold: those who have been in the regular practice of using the Vapour Bath are too apt to treat this fear with contempt, because they know by experience that the body is on the contrary fortified by it, and prepared to meet the vicissitudes of our changeable climate, but as it is certain that ridiculing fear is not the way to cure it, I would instead refer those who entertain this apprehension to Dr. Clarke's valuable Essay, where they will find the subject fully explained, and their experience will confirm his remarks. I much wish that the Vapour Bath was in more general use, for as the opportunities of observing its effects become more frequent its properties will become more accurately known, and its utility in a variety of disorders be better appreciated. I should not, however, have intruded my humble suggestions upon your pages, knowing as I do that apparatus for this purpose is to be procured at the expense of a few guineas, had I not believed that the two qualities of cheapness and convenience in my simple apparatus might recommend it to some of your readers as much as they have to,

"Sir,

"Your most obedient Servant,

"FITZ-SWEYN."

RESPIRATION,

Is the process of receiving a quantity of air into the lungs, whence, after having been retained a short time, it is again expelled in the action of exspiration; and if now examined, a portion of its oxygen is found converted into carbonic acid, and it is more or less loaded with aqueous vapour.

Obvious circumstances render it very difficult to ascertain the quantity of air taken into the lungs at each natural inspiration as well as the number of respirations made in a given time; the former is perhaps about fifteen or sixteen cubic inches, and the latter about twenty in a minute.

The aqueous vapour contained in the expired air is secreted by the exhalents distributed over the surface of the air-vessels of the lungs; attempts have been made to estimate its quantity but without success: it is probably liable to variation, and can scarcely be considered as a product of respiration.

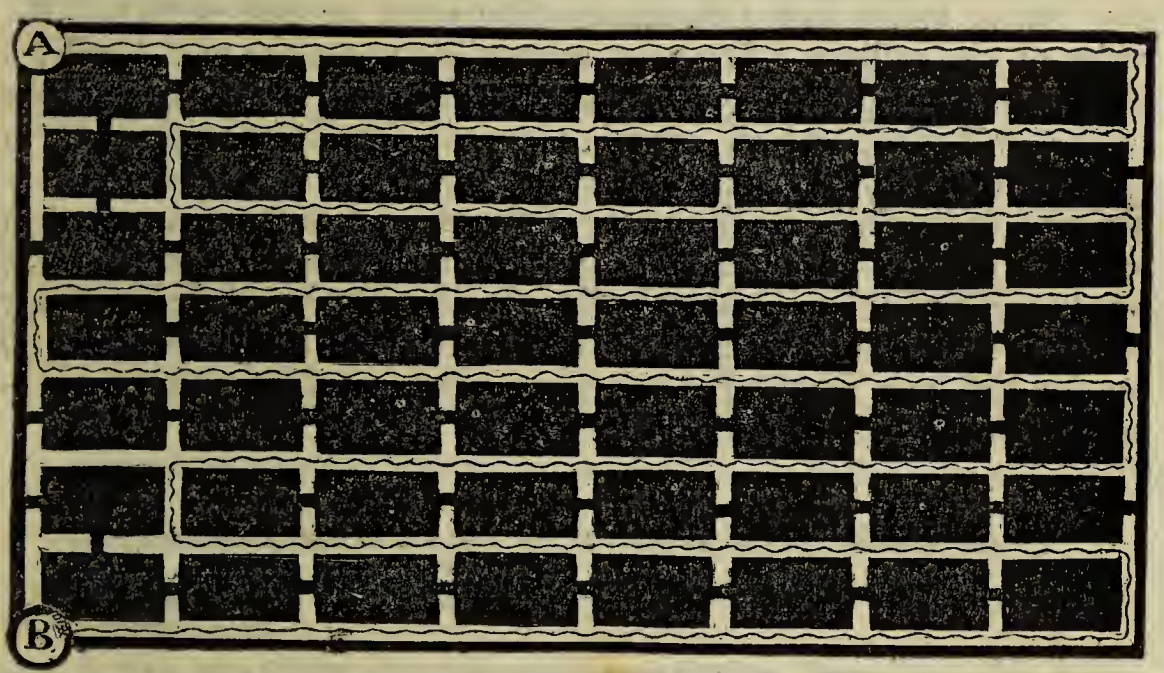
Different animals require very different quantities of oxygen for the purposes of respiration. Man and warm-blooded animals of course consume the largest quantity; the amphibious tribes not only require less, but can breathe in an atmosphere which will not support the life of the former; and many insects take such small quantity as sometimes to have been supposed capable of living without air, which is not the case. In the production of carbonic acid all animals agree, and consequently the nature of the deterioration suffered by the air is similar throughout the animal creation.

Fishes breathe the air which is dissolved in water; they therefore soon deprive it of its oxygen, the place of which is supplied by carbonic acid; this is in many instances decomposed by aquatic vegetables which restore oxygen and absorb the carbon; *hence the advantage of cultivating growing vegetables in artificial fish-ponds*—Brande.

HATCHING CHICKENS BY STEAM.

Scarcely is the egg exposed to the heat in the oven twelve hours, when some lineaments of the body of the embryo chicken begins to appear. The heart begins to beat at the end of the second day, at that time it has the form of a horse-shoe. On the third day two vesicles with blood, the pulsation of which is very evident, one is the left ventricle, the other is the root of the great artery; one auricle of the heart appears about the fiftieth hour, which resembles lace folded back upon itself; the beating of the heart may now be observed in the auricle, afterwards in the ventricle. The fourth day the wings may be distinguished; and, in the head, two knobs for the brain, one for the bill, and two others for the fore part and hind part of the head; the two auricles visible already approach nearer to the heart than they did before. On the fifth day the auricle that appears, seems to have two horns; but it afterwards appears to be auricles. About the sixth day the liver is seen; the first voluntary motion is observed at the end of one hundred and thirty-one hours; at the end of one hun-

dred and thirty-eight hours the lungs and stomach become visible. And at the seventh day, the intestines, the loins, the upper jaw, and two ventricles may be seen; and two drops of blood, instead of one which was seen at first, and the brain acquires some consistence. At the eighth day of incubation, the bills open, and the flesh appears on the breast. At the end of one hundred and ninety hours the sternum (or breast bone) is seen; and on the ninth day the ribs come out of the back; the bill and the gall bladder become visible. On the tenth day the bill becomes green; and if the chick be taken from its integuments, it can move itself insensibly. On the eleventh day, the feathers begin to shoot; and the skull becomes grisly. At the twelfth day the eyes appear, and the ribs are perfect at the two hundred and eighty-eighth hour. On the thirteenth day the spleen approaches the stomach; and on the fourteenth and fifteenth day, it encreases in size and bulk. On the sixteenth day the beak opens and shuts; and about the eighteenth day, the chick utters its first cry. Its strength then gradually increases, till it sets itself at liberty by breaking the shell in which it was confined.



PLAN OF THE WORKINGS OF A COAL MINE,

NEAR NEWCASTLE UPON TYNE.

The extensive collieries in the vicinity of Newcastle are preserved from the disastrous consequences which attend the accumulation of the fire-damp or hydrogen gas, by a complicated and expensive system of ventilation. The above sketch represents, on a small scale, the plan which is pursued to counteract the effects of that fatal evil, and to spread throughout the Workings a sufficient quantity of fresh air.

The coal is worked in narrow passages called boards, and headways; and the dark parts in the plan represent the pillars of coal left to support the roof. There are, generally, two descents to the Mine, or more, which are distinguished by the terms of the upcast

or downcast shafts. A, is the downcast shaft by which the air descends, and which is usually assisted by another shaft connected with it, the current of air is represented by the waved line which is carried through the main passages only, the sub-ways which diverge from them being stopped up by brattices, as a, and b, and its motion is accelerated by the heat of a large furnace situated at the bottom of the upcast shaft B, and thus the air after traversing the whole of the Workings ascends the shaft B.

What is technically called the choak damp is not of so dangerous a character as the fire damp, its presence being more easily ascertained, as it immediately extinguishes the lights, it has the effect of preventing animal respiration.

During gales of wind, or when the atmosphere is particularly dense, the ventilation of the mines is attended with more difficulty, and frequently, in those exigencies, the men are obliged to strike off work.

It is obvious that the above system of ventilation is attended with great labour and expense, not only from the number of hands employed to superintend the wastes and workings of the mine, but from the quantity of brattices which are incessantly required to stop the new ways, and where a communication must be held with the interior of the colliery. Doors at various distances are made, at each of which is placed a boy to permit the ingress and egress of the corves or baskets which contain the coal; the least negligence in closing one of these doors might be attended with serious consequences, as by changing the route of the current of the air, and thus leaving unventilated a certain district of the mine the hydrogen gas would accumulate, and upon the introduction of a candle immediately explode; from this circumstance many accidents have arisen, as no caution had been considered necessary where no danger was apprehended.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Christ's Hospital, December 30th.

"Sir,

"The invisibility of our town clocks at night has ever been a source of much perplexity to all but the catoptric genus, and in my humble estimation, the relief of so large a portion of our fellows is a subject worthy of consideration; should our opinions chance to coincide, perhaps you will allow your very useful publication to be the conveyance of a hint towards the removal of this deficiency, to milords the churchwardens, or such other persons as may be the protectors of elevated time-keepers. The subject has been casually considered before, I believe, but the inaccessibility of these most useful articles has hitherto been found an insurmountable difficulty, and we have thus been reduced to the sad necessity of relying upon our ears for information of the advance of our scythean enemy, in lieu of the much preferable evidence of our vision. However, this only apparent obstacle is, I think, effectually removed, by the discovery of the ig-

nition of hydrogen gas by granulated platinum; and if the clock wardens will vouchsafe to reflect a little upon this circumstance, I have no doubt, the reflection will fall upon these 'Mirrors of the Times,' and thence to the great relief of many a timeless being; but, if it be their pleasure to remain absorbent, I would with deference advise that the motion of the said Clocks be extinguished during the obscure season, by which economical system a great saving might be expected, for half the wear and tear being prevented a Clock would last twice the period that it would otherwise.

"I am, Sir,

"Your very obedient Servant and Reader,

"T. B."

"Perhaps this might also be an eligible mode (certainly a neat one) of illuminating gas lamps generally."

[We fully concur in the main spring of our correspondent's ideas. The subject is of some moment, and we heartily wish we could further the object he points at. We trust that the "Clock wardens" (for the time being) will make a minute of his timely hint, and that their exertions may be equal to *ours*; else, they had far better wind up their trust and be going, so that it may be placed in other hands. We dare say their notions will not exactly chime in with this, but they must regulate themselves to the striking necessity of others, or be *told* to change their quarters.]

THE ELEMENTS OF NATURAL PHILOSOPHY.

(Continued from Page 93.)

No. VI.—Hydrostatics,—or the Laws of Fluids.

Hydrostatics is the science which treats of the nature, gravity, motion, pressure, and general properties of fluid bodies.

A fluid is a body whose parts are capable of moving so easily among one another that they yield to the slightest possible force that acts upon them.

Fluids are either *incompressible* or *elastic*. If no degree of force be sufficiently great to compress a fluid into a smaller space, it is called an *incompressible* or *non-elastic* fluid; if it, however, can be made to occupy a smaller space, the contrary terms are applied. Water,* oil, and mercury are therefore non-elastic fluids; and air, steam, and all the gases are elastic or compressible.

Fluids are subject to the same laws of gravity as solids, but some peculiarities are occasioned from the want of cohesion which exists in the parts of a fluid body—now the parts of a solid are connected; they form a whole; and their individual weight is concentrated in a

* We confess that we are very little influenced by the result of Mr. Perkins's experiment. That the water might have occupied a smaller space we doubt not; but when it is known how great a quantity of air is contained in water we must be pardoned for our scepticism.

single point called the centre of gravity—the parts of a fluid gravitate independently of each other.

Fluids pass in all directions; upwards, downwards, sideways, and in every part alike.

The surface of any fluid when unexposed to external agitations will become level; because if one part of it were to remain higher than another it could be no longer a fluid; as it would resist thereby the force of gravity which tends to make it descend.

All fluids gravitate in proportion to their quantity of matter upon the bottom of the vessel in which they are contained.

The pressure of the same fluid is in proportion to the perpendicular height, and is exerted in all directions.

The bottom of a vessel sustains the pressure of a *column of the fluid;* the base of which is the bottom, and the perpendicular height equal to the depth of the fluid.

That is, supposing a glass, shaped like an inverted cone, with the point or apex of it truncated, as a base, were to be filled with water, the base would receive no more pressure than just the pressure of the column which arises from it.

So that "the pressure of a fluid, upon any given part of the bottom or sides of a vessel, is equal to the weight of a column of that fluid, having a base equal to that part of the bottom or side, and an altitude equal to the perpendicular height of the fluid."

When one fluid is specifically lighter than another, the lighter fluid will float upon the surface of the heavier; this will be seen with mercury, water, oil, spirits of wine, &c.

Because the lighter the fluid the less powerfully is it affected by the force of gravitation.

Every solid immersed in a fluid looses in weight so much as such a quantity of the fluid weighs as would fill its place, and the immersed solid retains as much weight as is equal to the excess of its specific gravity above that of the fluid. Such weight is called its *comparative gravity* in that fluid.

If the specific gravity of the solid be less than that of the fluid, then the solid will lose more than its whole weight; that is, the excess of the fluid's pressure will make it ascend to the surface and swim.

But if the specific gravity of the solid be greater than the specific gravity of the fluid, then its comparative gravity will cause it to descend, and sink to the bottom.

CHEMISTRY AND MISCELLANEOUS ARTICLES.

Crystallization.—In dissolving any crystal, and afterwards evaporating the water of solution, the crystal will form itself into its original figure. Even if a great variety of crystallized salts be dissolved in one body of water, upon evaporating the menstruum each salt will be found crystallized again into its primitive form. *Experiment:* Take half an ounce of each of the following sulphates, viz. sulphates of iron, copper, zinc, soda, potass, magnesia, and alumine,

dissolve them separately in warm water in glass tumblers; when completely dissolved, pour the contents of all into one evaporating dish of Wedgwood ware, and stir it well with a glass rod. Then set the dish in some warm place, free from dust, and where it will not be disturbed or shaken; when the evaporation has proceeded nearly to the close, the reproduction of the crystals may be observed going on, by a shooting in all directions throughout the liquid; and when the water of solution is entirely separated, the various sort of crystals will be found dispersed in groups, each distinct kind of crystal intermixed with the others, all of which may be separated and determined by their peculiar form and taste.

Liquefying of Gases.—Sir H. Davy has recently employed a very simple method of Liquefying the Gases by the application of heat. The gas is placed in one leg of a bent sealed tube confined by mercury, and applying heat to ether, alcohol, or water, in the other end. In this manner, prussic gas, and sulphureous acid gas was liquified by the pressure of the vapour of ether. The reproduction of these Gases occasioned cold.

James's Powder.—Mr. Phillips has recently analysed this Powder, and finds it to consist of peroxide of antimony 56.0—phosphate of lime 42.2—oxide of antimony, impurity and loss 1.8=100.0.

The true Cinnamon Tree.—Is a native of Ceylon, where it grows in the woods and hedges as common as the hazel does with us, and is used by the Ceylonese for fuel and other domestic purposes. The use of it is not confined to the bark; the leaves, the fruit, and the root all yield oils of very different qualities, and of considerable value: that produced from the leaves is called oil of cloves; that obtained from the fruit is extremely fragrant, of a thick consistence, and at Ceylon is made into candles, for the sole use of the king; and the bark of the root not only affords an aromatic essential oil, which has been called oil of camphor, greatly valued for its medicinal properties, but also a species of camphor that is much whiter and purer than that sold in our shops.

Sepia.—The water colour paint known by this name is obtained from a very remarkable fish, called Sepia, Cuttle, or Ink Fish. It is obtained in the form of a black liquid resembling ink, and is found in a sort of pouch, open on the breast of the animal, which it emits at pleasure. This liquid is collected and dried into masses, or cakes, when it is ground down, re-dissolved in water; evaporated again to dryness, and then formed into cakes for sale. It is an inhabitant of both the Atlantic and the Pacific, and are very plentiful among the rocks in the neighbourhood of Guernsey and Jersey.

The black liquid is used as ink, the shell in medicine, and the rest of the body is eaten, and considered as a great delicacy, in the above-mentioned islands. The anatomy of this animal is very curious; it is furnished with lungs, and has three distinct hearts.

Artist's Colours.—Mr. James Rawlinson's improved mode of preserving Oil Colours in bladders: "When the colour is ground I recommend the following mode of tying it up in preference to the

usual method: Instead of drawing the neck of the wetted bladder close (in the act of tying it up as usual) I previously insert a slender cylindrical stick, and bind the bladder quite close around it. This, when dry, will form a tube or pipe; through which when the stick is withdrawn the Colour may be squeezed when wanted; and the neck be again closed by replacing the stick. This is not only a better and much more cleanly mode than the usual one, of perforating the bladder and stopping the hole with a nail, or more commonly leaving it open to the prejudice of the Colour; but the bladder being uninjured may be used repeatedly for fresh Colour.

The barrel of a small quill may be tied, in place of the stick, into the neck of the bladder, with its closed end outward; which will keep the Colour secure in travelling, and when wanted the end of the stick may be cut off, and the orifice closed with a stick.

Phenomena of Shadows.—M. Mongez has remarked, that when the sun is quite free from intervening clouds, the shadows of bodies are surrounded by penumbras, which are very apparent, notwithstanding they are much more obscure than the shadows; and that when two bodies, each of which project a shadow, approach towards each other, at the moment preceding their coming into contact the shadows advance and change their form at the point of contact; a right line thus produces a curved shadow, and a globe projects a shadow like the summit of a paraboloid.—*Bib. Univ.*

It is asserted, that Sir Isaac Newton, though so deeply learned in Algebra and Fluxions, could not readily cast up a common account; when he was Master of the Mint he used to get somebody to do this office for him.

DOMESTIC ECONOMY.

Scarlet Fever.—Dr. Brown employs the solution of chlorine in Scarlet Fever with much success. The doses are from a tea spoon full to a table spoon full, which should be taken fresh, and swallowed quickly to avoid coughing.

To Whiten Ivory that has become Red or Yellow.—Boil alum in fair water, so much as will make it look white; into this immerse your Ivory, and let it remain in an hour; then rub the Ivory with a cloth, wipe it clean with *wet* linen rag, and lay them in a moistened cloth to prevent their drying too quickly, which causes them to crack.

On the important Uses of Soda.—Few articles are of greater importance to the arts, manufactures, and domestic economy, than Soda. It is essentially necessary for making hard soap, and forms an excellent substitute for that article; as four ounces of the former, and six of the latter, are fully equal to sixteen ounces, or one pound of soap, in washing, while it softens the hardest water, making a saving of from one third to one half the expense, according as the operation may be performed by hand, or by a machine. In the cleansing of worsted or flannel, the effects are fully evinced, which, when

managed with warm water, soap, and potash, acquire an unpleasant odour, and are apt to shrink, in consequence of the rubbing, particularly if they be immersed in cold water; whereas, by using the fossil alkali, these inconveniences are said to be completely avoided, and neither the quality of the goods will be impaired, nor the hands of the women be injured in the same manner as generally happens with the common ley.

As frequent bathing or washing of the body greatly conduces to health, it has been recommended to dissolve in the water so employed a small portion of Soda, or to wash with a towel wetted with a solution of soap and Soda, which opens the pores, and removes the unpleasant odour arising from profuse perspiration; a similar application will be productive of equal advantage to horses that are employed for racing, post chaises, or other purposes where great exertions are required.

If a weak solution of Soda be poured into foul bottles or casks, in which wine has been kept a considerable time it will completely dissolve the crust of tartar which adheres to the inner surface. Boot tops, saddles, or bridles, are effectually cleansed by a solution of Soda, preserving at the same time the original colour of the leather. This alkali may likewise be employed for sweetening kitchen utensils, and particularly for removing grease or acids from copper vessels; because these concretions when suffered to remain form a strong poison. In a similar manner it is used for tin and iron vessels, to keep them from becoming rusty. Utensils of the dairy that acquire an unpleasant acid smell, during the summer, and particularly after a thunder-storm, though every attention be bestowed upon them, such fetor may be completely removed by a small portion of Soda, which will render the milk vessels perfectly sweet; while it neutralizes and dispels the acid ferment imbibed by the wood, which would taint the milk. The crystals of Soda are not less useful in a medicinal point of view; a solution of it forms an excellent gargle for cleansing the throat, mouth, and gums, both in a sound and in a diseased or ulcerated state; while it whitens the teeth, and dissolves all incrustations that may be formed on their surface without injuring the enamel. And, if a small quantity of this liquid be occasionally swallowed, after washing the fauces of the throat, it is said effectually to remove a fetid breath. Soda is, in many instances, preferable to magnesia, for correcting acidity in the stomach; nay, it is even asserted, that it prevents the gout, gravel, stone, and similar disorders; lastly, if the alkali be mixed with cream of tartar, in the proportion of fourteen parts of the former to twelve of the latter, it furnishes one of the mildest laxatives, namely, the Rochelle Salt.

Preservation of Eggs for many Years.—Dip them in a solution of gum arabic in water, and imbed them in powdered charcoal. Charcoal being a non-conductor of heat, a uniform temperature will be preserved when moved from one climate to another.

To render Boots and Shoes Water Proof.—Pour into a vessel (such as painters use for their oil or turps), a pint of highly rectified spirit of wine; then add four ounces of Indian rubber, cut into

small pieces; after which close the vessel air tight and place it by the side of the fire or on the hob.—Shake it two or three times a day for a fortnight; the spirit will then have taken up a great portion of the Indian rubber and be fit for use.

Coat the boots or shoes, when new, (sole and upper leathers) two or three times, suffering each coating to dry before the next is applied.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1822, 1823.

PREVENTING THE DRY ROT IN TIMBER.—To the person who shall discover to the Society a certain method of preventing the dry rot in timber, superior to any hitherto known.—The Gold Medal, or Thirty Guineas.

GUNPOWDER MILLS.—To the person who shall invent and discover to the Society, the most effectual mode of preventing explosions in gunpowder mills.—The Gold Medal, or One Hundred Guineas.

BORING AND BLASTING ROCKS.—To the person who shall discover to the Society a more simple, safe, cheap, and expeditious method than any hitherto known or in use, for boring or blasting rocks in mines, shafts, wells, &c.

IMPROVED VENTILATION.—To the person who shall invent to the Society a mode of permanently ventilating the apartments in hospitals, workhouses, and other crowded places, superior to any now known or used.—The Gold Medal, or Fifty Guineas.

RECENT PATENTS.

To SAMUEL BROWN, of Windmill Street, Lambeth, in the county of Surry, gentleman, for his new-invented engine or instrument for effecting a vacuum, and thus producing powers by which water may be raised and machinery put in motion. Sealed 4th December, 1823.

To JOSIAH PARKES, of Manchester, civil engineer, for his invention of a certain method of manufacturing salt. Sealed 4th December, 1823.

To WILLIAM FURNIVAL, of Droitwich, and ALEXANDER SMITH of Glasgow, for their invention of an improved boiler for steam engines and other purposes. Sealed 9th Dec. 1823.

To THOMAS TODD, of Swansea, South Wales, organ builder, for his invention of an improvement in producing tone upon musical instruments of various descriptions.

TO OUR READERS AND CORRESPONDENTS.

We very heartily shake hands with E. A. B. *whose two Epistles came safely to hand.* Could he think, sad dog, to deceive us? Why this duplicity, E. A. B.—eh? Why not have instituted your enquiries at the same time—was *time* the cause? Let him give us a little of it and he shall see that we are not inactive spectators of the matter he writes about. When the foundation shall be fitted for our bricks and mortar *then* will we raise our superstructure.

L. H.'s communication will be inserted in our next.

We can assure W. S. that his Letter was not delivered to us in time for publication in our last Number, which was in the press two days earlier than usual on account of the Holidays.

Our Correspondent J. B. will perceive that we have not been inattentive to her enquiries;—we have inserted a cosmetic for the ivory handles of her table-knives—by the use of which they may be made to approximate so nearly in tint to the fair hands that wield them, as not to be distinguished but by their figure.

Ignoramus's intelligent letter came too late for insertion in our present number.

[*To be continued every* FORTNIGHT.]

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REGISTER

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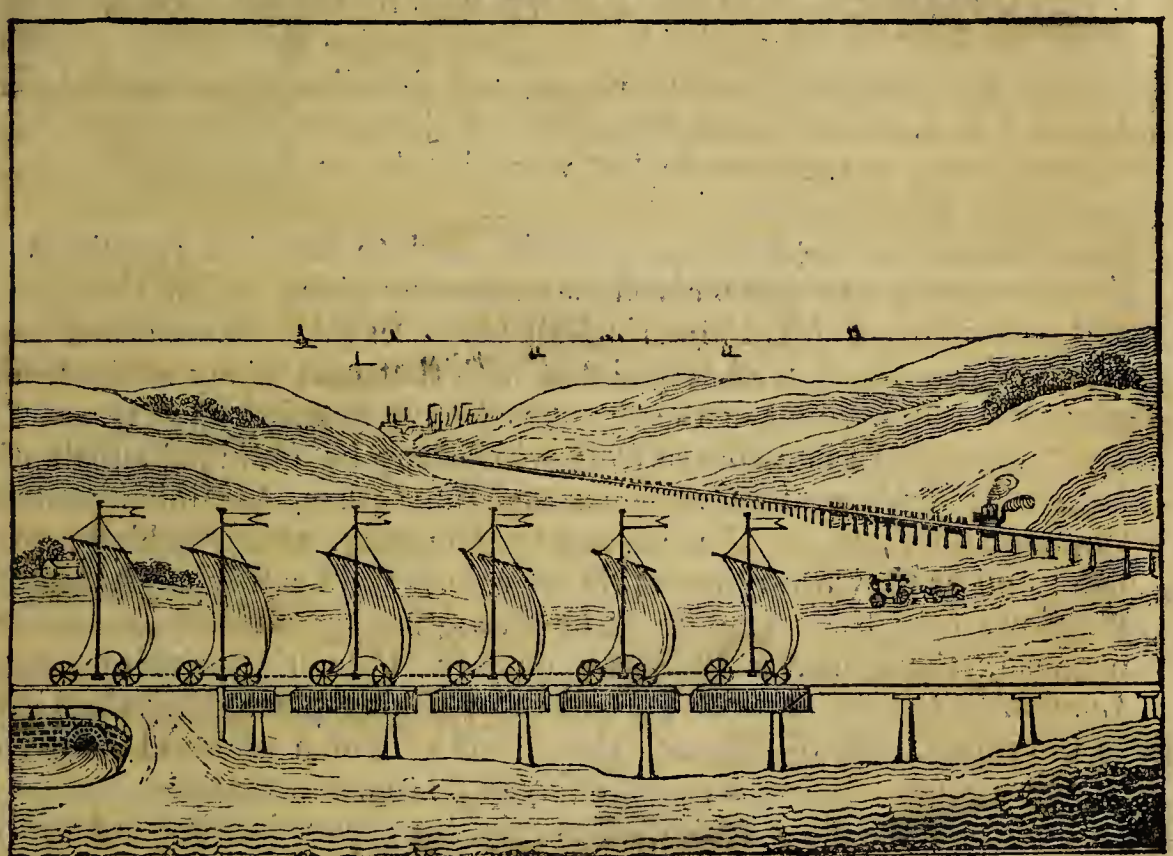
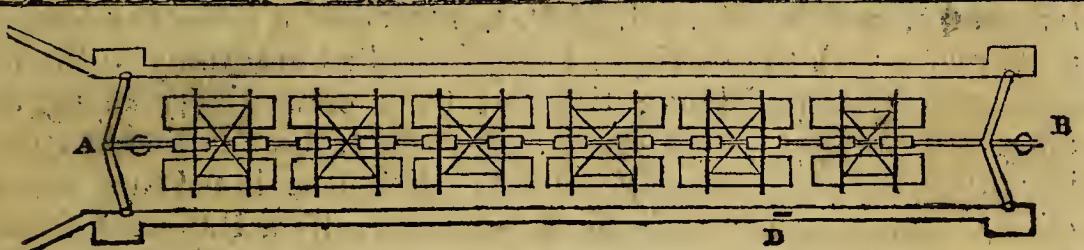
IMPROVEMENTS & DISCOVERIES.

No. 8.] SATURDAY, JANUARY 24, 1824. [Price 3*d*.





PROPOSED SCHEME OF AN IRON RAIL-WAY.

FROM *Shoreham Harbour to Brighton, and from thence to London, for the conveyance of fish for the London market, as well as goods and passengers, &c.*

Likewise on the peculiar facilities afforded by Mr. Palmer's principle of Rail-way, for sailing by land; the advantages thereof, &c.— in a letter

"To the Editor of the Register of the Arts and Sciences, &c.

"SIR,

"As the prices of almost every article of consumption are materially affected by the cost of carriage, it must be admitted that there are few subjects of more real importance to the public at large, than our inland communication; it was, therefore, with peculiar

pleasure I read in the last number of the Register of the Arts and Sciences, your account of Mr. Palmer's simple, yet grand invention, of a Rail-way upon an entirely new principle. I need hardly say that I am quite charmed with it,—because I see in prospective the immense advantages and conveniences that will result to the public from its general adoption.

"I will not fatigue your readers with details of plans (that I have been cogitating upon over a fragrant pipe of Virginia) for transporting the produce and manufactures of one hemisphere to the other, across the isthmus of Darien; nor notice the facility afforded by the new Rail-way for conveying merchandize from the Nile, at Grand Cairo, to the Red Sea, but will keep myself at home, and offer nothing to their notice but what is obviously practicable, and decidedly advantageous.

"To curtail as much as possible, and to avoid a repetition of the interesting description you have already given us, of the nature and principles of Mr. Palmer's Rail-way, I shall presume that your readers are already well acquainted with that part of my subject, and proceed to an account of the schemes I have founded upon it.

"As the sea is a source from which may be obtained substantial nutritious food, at less expense than any other, the inhabitants of small islands, and of the sea-coasts generally, subsist chiefly upon fish; and as they are remarkable for robust and healthy constitutions, it follows that their food must be strengthening and wholesome. I propose, therefore, a Rail-way on Mr. Palmer's principle, from London to the nearest sea-port town or fishing-place, that shall give to the inhabitants of this city the advantages of a plentiful supply of the cheap and wholesome food enjoyed by those in marine situations. In the drawing which accompanies this, the scene sketched is entirely imaginary, and is intended, *first*, to represent a Rail-way leading to a sea-port, with the carriages being propelled according to the modes projected by Mr. Palmer; the first train of carriages being drawn along the rail by a steam engine, the second, more in the perspective, is supposed to be drawn by a horse. Brighton is perhaps the most eligible situation for such an undertaking; by a Rail-road from that place, the London market might be supplied with a prodigious quantity of fish within three or four hours after their being taken from the sea, at a very trifling expense of carriage; and if the wind were to be employed as an auxiliary propelling force (which I propose), the expense of carriage would be so much lessened, and the rapidity with which the fish might be brought to market so much increased, as to give to us all the advantages of a sea-port town in the purchase of it.

"Sailing over land is not a new idea, nor is it new in practice. In some parts of Holland four-wheeled carriages have been propelled by the wind over the common ground, on level plains, for more than a hundred years. If the Hollanders found it practicable or advantageous to sail in this clumsy unimproved way, how much more practicable and advantageous would it be to bring into use the admirable means furnished us by Mr. Palmer in his new Rail-way—in which the friction, or resistance to the motion of the carriages, is

reduced to one twentieth part; or rather, wherein the facilities are increased in the reverse proportion? If in Holland, as is stated, they could sail after their manner twenty miles in an hour, with a good wind—with what an astonishing velocity might not the vessels or carriages sail on the proposed Rail-way when impelled by an equal power! As objections will no doubt be raised on account of the variableness of the wind, I must repeat, that I only propose it as an *auxiliary* power. It would rarely happen that the wind was not favourable in going or returning—and it is well known that S. W. winds prevail more than any other, in our quarter, which would be favourable for the traffic to London. I would propose in the absence of a steam-engine, (which every proprietor of a train of carriages might not be able to afford), that a horse should always be in attendance; so that when employed in drawing a train along the Rail, if a breeze of wind should spring up, the sails might be spread, and the horse clapped into a carriage properly constructed to accommodate his noble person, where, in comfort, feasting over his bag of corn, his frame would be re-invigorated for fresh exertion should the wind happen to fail.

"Having now given the outline of my first project, and being fearful of wearying the patience of your readers, I proceed to my second, which will explain the meaning of the sailing vessels in the fore-ground of the drawing, that are apparently issuing out of a canal lock. My intention in this was, to exhibit an easy, and obviously practicable mode, of transferring heavily laden vessels directly out of the water on to the Rail-way, where they might be propelled by the wind with as much velocity as through the water; and at the same time to shew how admirably Mr. Palmer's Rail-way is adapted as a branch communication to and from canals and rivers, or to form an important connecting line between them.

"In cutting a canal, which has to proceed down a declivity, and to ascend another inclined plane, numerous locks must be constructed at an enormous expense, which cause great loss of time, and inconvenience in the traffic. This heavy expense and inconvenience would be completely obviated by the adoption of Mr. Palmer's Rail-way—as a connecting communication.

"The vessels issuing from the lock on the right, are supposed to have entered it from some river or canal, (as at A in the ground plan of lock). The Rail-way is constructed as usual, elevated upon pillars—and does not terminate on arrival at the lock gates, but passes over it, and terminates at the other end of the lock, just within the second gates, and is supported on pillars from the bottom of the lock, the same as on dry ground. The double train of vessels having all entered the lock, half on one side the Rail, and half on the other, they are hooked on to the axletrees of the wheels which are already upon the Rail ready for that purpose. The gates next to the river or canal are then closed, and all being fast, the water is let out of the lock by a sluice (shewn in the drawing) till it falls below the bottom of the outer gates, at which time the vessels are all suspended on their axles in the air—the gates are opened, and they sail out

across the valley;—or they are propelled by whatever other power may be eligible.

"*Description of the Plan of the Lock.*

"A is the end of a canal or cut from a river, with the lock gates adjoining. B is the exterior of the other end of the lock, over the whole length of which the Rail-way extends; a portion of which is seen at B. On the Rail-way are shewn the edge view of the wheels, with the axletrees, which extend over the vessel, two to each vessel; the vessels are thus arranged and hooked on to the axletrees, when the sluice D is opened, and the water let out, which leaves the vessels suspended.

"From Shoreham Harbour to Brighton, over the shingles, would be a very eligible situation for a Rail-way upon Mr. Palmer's principle, which might be constructed with facility and at very little expense, when the important advantages that would result are taken into consideration; which Rail-way might afterwards be connected with the one to be commenced to proceed to London, when the advantages of the first undertaking had been proved—*if proofs were necessary in a matter so evident.*

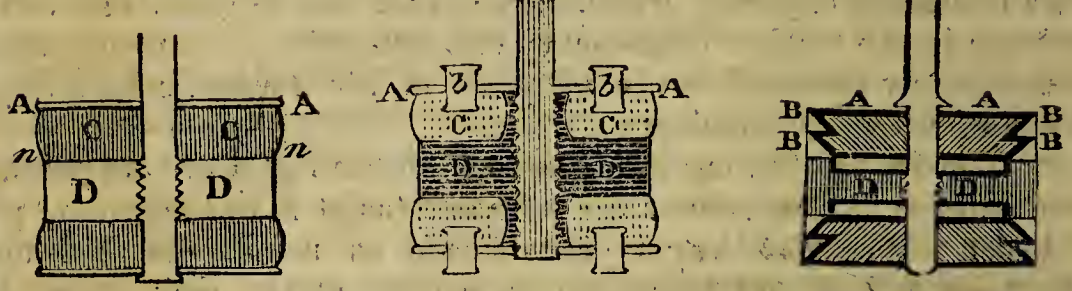
"A single horse would draw a loaded mail coach, or other machine of equal weight, along the Rail-way, with less labour and greater speed than is now effected by four horses: the smooth and uniform motion of the carriages, and the impossibility of their overturning, affording the utmost ease and security to the passengers.

"I remain, Sir,

"Your humble Servant and constant Reader,

"L. H."

Fig. 1. *Fig.* 2. *Fig.* 3.



STEAM-TIGHT ELASTIC PISTONS.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir,

"Steam-tight Elastic Pistons being a subject of much consideration, and upon which many had exercised their ingenuity, I take the liberty of sending you the following for your approbation, their novel features being that they are *steam-tight in proportion to the force of the steam which presses upon them.* In *Fig.* 1. A A is a metal plate *sliding* upon the Piston-rod; D D the

solid part of the Piston, connected with the plate by the leather band *n n*:—the space C C is filled with oil or other fluid. It will be evident, from inspection, that the greater the force of the steam, or other pressure, upon the surface of the plate A A, the more closely will the surrounding leather be pressed against the sides of the cylinder. *Fig.* 2. is a variation of this method:—the plate is *fixed*, and the steam produces the same effect by driving in the bolts, *b b*—as metallic Pistons are generally preferred. In *Fig.* 3. I have endeavoured to give elasticity to the 'stuffing' by similar means:—A A a metallic plate sliding on the Piston-rod, and made in the form marked by the dark line; B B, the metallic rings, or stuffing, of a triangular form; D D the solid part. The pressure of the steam causes the plate to descend, which, pressing upon the inclined planes of the rings, of course causes them to expand, and adhere to the sides of the cylinder: (there is a small space left between the solid part and the plate, to allow for the descent of the latter, but in no way so great as here represented.) Each of these Pistons would be perfectly elastic, and therefore would accommodate itself to every irregularity. It is much against them that they are obliged to have these contrivances both on the upper and lower surface to be acted upon alternately by the steam; but I leave it to more ingenious men than myself to improve upon them; and remain, Sir,

"Your's, &c.

"E. A. B."

IMPROVEMENTS IN SHIP BUILDING.

In a former number of our Register we humbly stated our opinion on the merits of Annesley and Sowerby's Patent Method of Ship Building, as conferring greater strength and buoyancy than can be obtained in vessels built upon the old or common system; an opinion, however, which we should perhaps not have hazarded, had it not been supported by the united approbation of several scientific men, and by many well-informed practical ship-builders. There are, nevertheless, numerous clever men who think differently from those; who give a decided preference to vessels built upon the old or general system. Improvements are the order of the day in naval architecture, as well as in every thing else, and a week scarcely passes without our hearing of some "*great improvement*" in the arts, and extending to every sort of apparatus belonging to a ship; patent cables, patent anchors, patent sails, patent capstans, patent masts, &c. &c.

The specification of a patent recently taken out by Mr. Joseph Brindley, of Rochester, is now lying before us, for inclosing the various timbers of ships and boats (particularly those which constitute the frame), between strong plates of iron, copper, or other metals; and also for attaching the various planking, which form the bottoms, sides, decks, and other parts of ships, by means of long strips of metal; and for supporting the decks, &c. by large rings of metal, which resting upon the keels, are placed fore and aft in one line the whole length of the vessel. The advantages thus gained of

increased strength and power to resist the effects of percussion, will, we think, be counterbalanced by other serious disadvantages. The expense must thereby be greatly increased, and the enormous weight of the metal must materially lessen the buoyancy, and consequently reduce the capacity of a vessel for a heavy cargo.

IMPROVEMENTS IN DYEING.

Mr. Richard Badnall, of Leek, in Staffordshire, silk manufacturer, has recently taken out a patent for some improvements in the art of dyeing silk, which we think are too important to be merely glanced at, and as the specification is very concise and clear, we insert the whole of it, verbatim, as follows:

"I, the said Richard Badnall do hereby declare, that the nature of my said invention, and the manner in which the same is to be performed, are particularly described and ascertained in and by the following specification thereof; that is to say:

"My improvements consist, first, in the application of Prussian blue to the purposes of dyeing silk, cotton, wool, or any other article; and, secondly, in the application of pressure to Dyeing in general. The following is my method of Dyeing by means of Prussian blue.

"The Prussian blue being previously ground as fine as possible, is to be put into any convenient vessel of glass or earthenware. Strong muriatic acid is to be poured upon it a little at a time; and the mass is to be kept constantly stirred, with a rod of white wood, a piece of tobacco pipe, or any other material not liable to be acted upon by the acid. The stirring must be continued, till the mixture has become a smooth homogenous mass of a semi-gelatinous consistence. The proportion of acid requisite for this purpose depends, in some degree, on the quality of the Prussian blue, and, therefore, cannot be precisely set forth in words; but, by proceeding carefully, as above described, it is impossible to fall into error; as the mixture, if made too thin from excess of acid, may be rectified by the subsequent addition of more Prussian blue.

"This mixture, which I call prepared Prussian blue, may be used as soon as made; but it is better after three or four days; and I have not found that its qualities are altered by age.

"In dyeing silk with the Prussian blue, prepared as above, I proceed in the following manner:

"The gum having been discharged from the silk by any of the usual means, I steep the silk, for three or four hours, in a cold solution of alum in water, of the common strength employed by silk dyers: I then rince it in cold water.

"The dye vat is composed by diluting the prepared Prussian blue with cold water, till its colour is of the required depth, according to the particular tint intended to be given to the silk. The silk, prepared as above, is then to be put on sticks, and immersed in the bath; taking care that it be constantly turned, that the colour may be perfectly level, and that it remain in the bath till it has acquired the proper tint or shade. It is then to be well washed in running water

ceases to be discoloured by it. Lastly, the silk is to be dried, either in the shade, or in a stove, heated to not more than a summer temperature.

"From Prussian blue, prepared as above, various greens and purples may be obtained; either by combining it with the ingredients usually employed for such colours, and dipping the silk in this compound bath; or, by using the bath of prepared Prussian blue, either before, or after the application of the other ingredients, according to circumstances, and to the nature of such ingredients. The proportion however it is not necessary to recite; the object of this part of my patent being merely by my new mode of preparing Prussian blue, so as to dye silk, cotton, wool, or any other article, by means of it, either alone, or mixed and combined with other dyeing materials.

"The second invention I claim, is the application of pressure to dyeing in general, whether it be that of thick cloths, hats, woods for veneering, or any other purpose; or any other or more delicate materials, such as linen, cotton, or silk goods, lace, &c. For this purpose, the materials to be dyed are to be placed, with the dyeing liquor, in any suitable vessel of wood, copper, iron, or other material; the aperture of which vessel can be secured water-tight, by a lid fitted to it by any suitable and well-known means. To this vessel is to be fitted a hydrostatic pressure-pump, or any other machinery, employed for the purpose of producing high pressure; such as a column of water or mercury of sufficient height, &c. All things being thus adjusted, the lid is to be fitted securely on; and the pump worked, until the necessary pressure is obtained; when it is evident, that if the goods are put in dry, or well wrung, the pressure thus produced will greatly facilitate the introduction of the dyeing liquor within the internal pores, particularly in heavy cloth goods, hats, woods, hard twisted silk, or lace; and, if necessary, suitable mechanical means may be employed to agitate and wring the goods while under pressure: but I do not claim this exclusively, but only the application of pressure to the forcing of the dyeing liquor into the pores of the cloths, hats, silk, woods, &c.; or the joint application of pressure, with suitable means for producing agitation, &c. &c.

VAPOUR BATH.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir,

"Allow me to congratulate you on the growing celebrity of your Register. In the last number of it I observe a detailed account of a *Cheap Vapour Bath*. I beg to be favoured with a page of your sheets, in order to make a few observations on the subject of Vapour Bathing, which, without hesitation, I affirm to be the most pleasant, safe, and most important agent, in the preservation of health, and in restoration from disease, that has ever been resorted to by mankind. It is a remedy that nature has unequivocally been pointing out to us every day; it produces Perspiration, *Nature's*

grand restorative. The suppression of that function, in the human species, is, generally, the predisposing and aggravating cause of all fevers, inflammatory, and painful disorders. To remove that suppression, is the object urgently enforced by all medical practitioners, as much as variety and quantity of medicine will effect it; the art of prescribing and compounding medicine, is to them so essential, that they prefer that mode, uncertain, unpleasant, inconvenient, and expensive as it is, to the more simple, certain, and easy mode of producing the desired effect by the Vapour Bath. The reason is so obvious, that it requires no illustration, but is quite sufficient to explain why so desirable a method of relief to the public should have been so tardily or reluctantly adopted by the faculty. I am no *doctor,* only a *reasoner,* and can readily conceive how such numbers of glandular, rheumatic, and skin diseases, owe their cause and continuance to a want of perspiration, or healthy state of the skin, or surface of the body, which, if its important functions be properly performed, must mitigate or carry off these diseases, so rife in our changeable climate. It requires no philosophy to understand why acute diseases from the same obstructing cause, are increased in violence; indeed, where perspiration can be produced, in all fevers, and painful inflammatory diseases, it is the joyful harbinger of cure, or relief.

"Having given much deliberate attention to this subject, I feel myself called upon to make a few observations on the communication of your correspondent Fitz-Sweyn, particularly as it seems neither he or yourself are aware that a much better bath appeared before the public, in the London Medical Journal of last month; it was by mere accident shown to me, and it seems so well adapted for the purposes intended, that nothing more can be required; a reference is given to Mr. Green, a Surgeon in Bury Street, St. James's, who, it appears, has boldly swerved from the routine practice, and avails himself of the advantages to be derived from this remedy. Such conduct deserves more grateful notice from the public than I have leisure here to notice. It is a very desirable circumstance to have a good thing at small cost, but Mr. Fitz-Sweyn's Bath is too cheap to be good for any thing; it does not appear that he has contrived any means to control the column of vapour, consequently the patient is in danger of being scalded; if the patient should be very old, very feeble, or very ill, it would be a difficult matter to place him over the vapour or under his apparatus, which altogether is too inconvenient, inappropriate, and cumbrous; it is six feet high, and the head is enclosed. Vapour, like all other elastic airiform bodies, will ascend; the head and trunk of the body would thus become the hottest, and from occasioning too great a determination of blood to the head may prove dangerous, which is the faulty principle on which Vapour Baths have hitherto been constructed in this country; and what makes it more objectionable, it is unnecessary, as the same general perspiration would be produced, if the patient is allowed the privilege of breathing the atmospheric air. In some diseases of the lungs it may be useful if properly managed, but where there is ulcer on the body, or any complaint of the skin, it must be next to inadmis-

sable, as will readily appear to any person who will consider the matter. The Bath I have alluded to has none of these objections, but many more advantages than I have leisure to enter into. The Bath, with the packing case, and the whole of the apparatus, including dresses, weighs but twenty-five pounds, and is exceedingly portable: it is so contrived, that when used, the feet are constantly, or at pleasure, kept many degrees hotter than the body; and it can be adjusted so as to apply the increased heat to any part of the body, or locally even to a solitary enlarged gland on the ear, as in cases of deafness.

"I am, Sir,
"Your constant Reader and obedient Servant,
"VERITAS."

ITALIAN IRONS, FLAT IRONS, &c.

Several inventions have recently been made in the irons used by laundresses for smoothening linen, and in the manner of heating them. Mr. John Nicholson, of Lambeth, has taken out a patent for an apparatus for heating those called Italian Irons. His apparatus is in the form of a cone, which is made hollow, for the purpose of being heated, by means of a lamp which is placed within, at the bottom;—the apex, or top of the cone, is inserted into the Italian Iron, which is of the usual cylindrical form, and is heated, and kept hot, as long as may be required, from the heat of the lamp.

Mr. Nicholson's patent also extends to the heating of Curling Irons for the hair, by an apparatus on a similar principle. A tube is inserted in the top of the cone, in a perpendicular position, over the lamp; the lower end of the tube is of course closed, and the upper end is left open for inserting the Curling Irons. Mr. Nicholson proposes by similar means to heat the Irons used by apothecaries for spreading plasters—as well as those used in many other operations.

The annexed engravings are a representation of another invention of a Flat Iron by Mr. Taylor, of Birmingham.

Fig. 1.

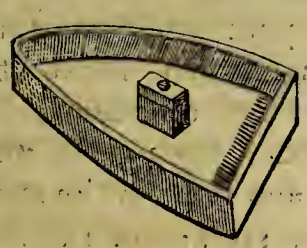


Fig. 2.

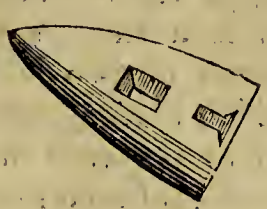


Fig. 3.

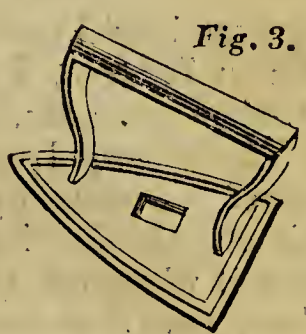
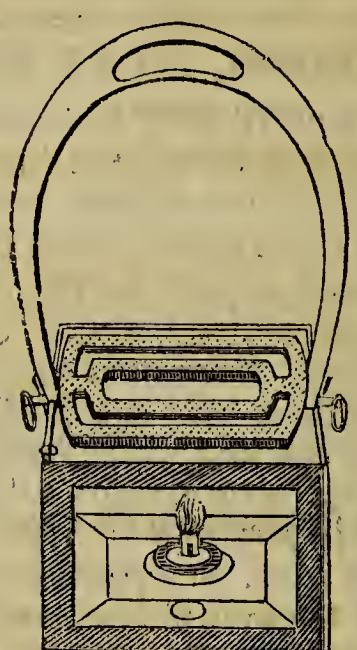


Fig. 4.

Fig. 1. represents the face of the Iron, which is hollow in the inside, with a stub, or block of iron, which is cast of one piece with the face—on the top of this stub, or block, is fixed an iron button of

the same size, or rather smaller than the slab. *Fig.* 2. is the heater, with a square hole in the middle, which is made to fit into *Fig.* 1. *Fig.* 3. is the upper part and handle of the Flat Iron, having also a square hole in it;—so that when this is placed over the former two, the button passes through the whole, and it is all made fast by giving the button half a turn, which is done by striking it with the heater handle, *Fig.* 4. The heater handle is used for taking out and putting in the heater, as well as for placing it in and out of the fire, which is effected by thrusting the iron end of the handle into a groove made in the heater for that purpose.

Taylor's Flat Iron can be made at a less expense than a box iron, and is intended as a substitute for it.



THE STIRRUP LANTERN.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"BEING an old traveller of the equestrian order, and having experienced much comfort and convenience from the use of the Stirrup Lantern, I am desirous of recommending it to the notice of travellers generally, through the medium of your interesting work.

"The Stirrup Lantern is a small square lantern, fixed at the bottom of a stirrup by means of two screw rings on each side, as exhibited in the drawing which accompanies this; they serve also to unscrew it whenever it may be required to detach it from the stirrup. The lamp part is so contrived that no oil can be spilt; nor the steady light, which is thrown across the road before the horse's feet, be at all impaired by any motion of the horse. The front part, as shewn in the drawing, is of glass, through which is seen the lamp, burner, and wick; behind these is placed a reflector, for transmitting the light to the front. It is supplied with a constant current of air by means of apertures, in a sort of double casing, which are so disposed as to prevent any gust of wind from affecting the light.

"This is not, Mr. Editor, an article of mere luxury, but one which confers the most solid comfort to the way-worn, benumbed, and benighted traveller. I make no doubt, indeed, that the Stirrup Lantern will be the means of saving many a neck from being broken; that my own is still entire is frequently a matter of wonder, when I consider how 'many a time and oft' I have been precipitated into hedges and ditches by some unlucky step of my horse.

"In conclusion, I think it necessary to state for the information of my brethren of the Stirrup, that I procured my apparatus of the inventor, Mr. Peat, of Piccadilly.

"I am, Sir,

"LAMBETH, "Your obedient Servant and constant Reader,
"14*th January*, 1824. "P. PRYNNE."

We think the Stirrup Lantern would be found particularly useful to medical practitioners in the country, when they have occasion to visit their patients at night.—*Ed.*

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"If you, or any of your numerous Correspondents would favour me with a description of the Hydrostatic Pump, for raising great weights, it would confer a great favour upon

"Your humble Servant,
"*January* 14*th*, 1824. "PAM."

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"WILL you, or some of your correspondents, be pleased to give this through the medium of your highly interesting and very useful publication, some account of the present mode of boring for water, by so doing you will much oblige

"IGNORAMUS.

"Your observation on the poison of the bee in your last number, brought to my remembrance some experiments I tried on one some time ago. Having caught a bee, I irritated it, and caused it to eject its poison against a small piece of writing paper, by which means (with the aid of a magnifying glass) I noticed the poison does not pass *through* as one might suppose the spear which is thrown out of its body; but being forced from the small bag in which it is contained at the *end*, (by contracting I conceive the part, so as to throw out the spear with more force), it flows down a furrow on the upper surface, to the *point*."

CHEMISTRY, &c.

MAGNETISM OF TITANIUM, COBALT, AND NICKEL.—Dr. Wollaston has recently discovered that these metals are attractable by the magnet. By suspending a crystal of *Titanium* by a fine thread, the

attractive force was sufficient to draw it about 20° from the perpendicular; consequently, the force of attraction of this metal is about one third of its own weight. A cubic piece of *Iron* of the same size, and weighing half a grain, had its attractive force to the same magnet to that degree which enabled it to lift from 80 to 90 times its weight of a silver chain. The attractive force of *Cobalt* was such as to render it easy to carry from 50 to 60 times its own weight; and Nickel from 20 to 30 times its own weight.

Respiration of Frogs.—By the "Annales de Chimie et Physique" for January, 1819, it appears that a series of very curious and interesting experiments were performed by M. Edwards to shew that frogs, toads, and lizards, are preserved alive and in health under water for weeks, by means of the air contained in the water which they *abstract not by the lungs but by the skin!*

Production of Light by breaking Glass Balls filled with Oxygen.—A very curious and important experiment was two or three years since made by M. Biot. It consists of breaking, by means of a suitable apparatus, a ball of glass filled with oxygen gas, and placed in the receiver of an air-pump, in which as perfect a vacuum as possible has been formed. The effect of this is to produce a brilliant light in a dark apartment.

The Laws of Gravity.—To shew that the retardation in the fall of light bodies is owing solely to the resistance of the air, place a piece of thin paper on the bottom of a small box, of such a weight, that in falling the bottom will always keep lowermost, and having let fall the box and the paper from the height of two or three yards above a cushion they will both reach it at the same time; while a piece of paper from the same size let fall at the same time will flutter slowly and obliquely to the ground. The experiment will succeed if the paper be placed on a crown piece, or any other heavy body.

Effects of the Chloride of Lime as a Disinfector.—Messrs. Orfila, Lessure, Gerdy, and Hennelle, recently had occasion to examine the body of a person, supposed to have been poisoned, and who had been dead for nearly a month; the smell from the body was so insupportable, that they were induced to try the effect of an application of the chloride of lime, as recommended by M. Labarraque. Accordingly, they sprinkled a solution of this substance frequently over the body; the effect was truly wonderful; they had scarcely made a few aspersions, when the disagreeable odour was instantly destroyed, which enabled them to proceed in their operations in comparative comfort.

MISCELLANEOUS ARTICLES.

Queen Bees.—A hive of Bees cannot subsist without a queen, as she produces their numerous progeny; hence their attachment to her is unalterable. When a queen dies, the bees immediately cease working, consume their honey, fly about at unusual hours, and eventually pine away if not supplied with another sovereign. The

death of the queen is proclaimed by a clear and uninterrupted humming, which should be a warning to the owner to provide the bees with another queen, whose presence will restore vigour and exertion. Mr. Huber by repeated experiments confirmed the curious discovery of Mr. Shirach, that when bees are deprived of their queen, they have the power of selecting one or two grubs of workers, from which they produce queens, by making for them larger cells, and supplying them with a larger quantity of food, and food more pungent than that given to the common larvae. This singular fact has been much disputed of late, but we think that the following letter from the Reverend Mr. Dunbar, of Applegarth, which appeared in the Edinburgh Journal, will set the question at rest.

"In July the Mirror hive was full of comb, bees, brood and honey, the queen very fertile, and laying at the rate of one hundred eggs per diem. I opened the hive and took her away. For eighteen hours they continued to labour, as if she was still with them, at the end of that time they missed her, and all was instantly agitation and tumult; the bees hurried backwards and forwards over the comb with a loud noise, rushed in crowds to the door, and out of the hive, as if they were swarming, and, in short, exhibited all the symptoms of bereavement and despair. Next morning they had laid the foundation of five queen cells, having demolished the three contiguous cells to the one containing a worm which suited their purpose, and by the afternoon four more, all in parts of the comb, where before were nothing but eggs and common worms of one or two days old. Two of these royal cells advanced more rapidly in size than the rest, probably from the larvae being of an age fittest for the purpose; four came on more slowly; and three made no progress after the third day. On the seventh day the two first were sealed, two more were nearly so, all the rest continued stationary, and, in fact, remained so, as if the bees satisfied that they had at least secured one queen, did not think it necessary to carry forward the others to maturity. On the morning of the fourteenth day from the removal of the old queen, a young one emerged from the cell, strong, active, and exactly resembling those produced in their natural way. While examining her motions, I saw her hasten to the royal cell, which had been closed about the same time with the one from which she was come, and attempt to tear it open, doubtless with a view of destroying its inmate; but the working bees pulled her away with violence, and continued to do so as often as she made the attempt. At every repulse she stood in a sulky posture apparently, on the comb, and emitted the shrill *peep, peep,* so well known to bee masters, while the unhatched queen at the same time sent forth a peep also, but of a hoarser kind. And this accounts for the two different sounds which are generally heard in the evening from a hive about to throw a second swarm. The shrill sound proceeds from the reigning queen, and seems to express her rage and disappointment at being baffled by the watchful guardians of the unhatched queen, from whom the hoarse sound comes. In the afternoon of the same day, the last-mentioned female left her cell; I saw her come forth in majesty, finely

and delicately formed, but smaller than the other. She immediately retired within a cluster of other bees, and I lost sight of her. Next morning on opening the shutter of the hive, I perceived the youngest queen rushing in great terror on the face of the comb, and turning round the edge of it to the other side; and in the next moment the other queen was seen pursuing with equal rapidity. I now fully expected to see Huber's combat of queens, and was about to wheel round the hive on its pivot, to inspect the proceedings on the other side, when business called me off. I returned in half an hour thinking I might yet be in at the death, but found all was over; the young queen was lying on the alighting board, on her back, in the agonics of death, newly brought out by the bees, and doubtless the victim of the elder queen."

Water, the only Aliment of Plants.—Plants appear to require for their support, water, earth, light, and air; various experiments have been made which seem to prove that *water is the only aliment* which the root draws from the earth. Van Helmont planted a willow weighing fifty pounds, in a certain quantity of earth, covered with sheet lead, and watered it for five years with *distilled water;* at the end of that time the tree weighed one hundred and sixty-nine pounds three ounces, and the earth in which it had vegetated, being weighed, was found to have lost only three ounces. A similar experiment was made by Boyle; his plant at the end of two years weighed fourteen pounds more, and the earth in which it had vegetated had not lost any perceptible portion of its weight. Instead of earth, Messrs. Duhamel and Bonnet supported Plants with moss only, and fed them with nothing but pure water; they thrived, and vegetated in the most vigorous manner. M. Tillet raised Plants which vegetated in perfection, in pounded glass or quartz, feeding them with nothing but water. Mr. Hales has observed that a plant which he weighed had gained three ounces after a heavy dew. M. Bracconett found mustard seed to germinate, grow, and produce plants, which matured, flowered, and ripened their seed, in litharge, flowers of sulphur, and even small unglazed shot.

It is not by the roots only that plants absorb water, the leaves have the property of extracting it from the atmosphere. Many of the plants that grow in the water have no roots at all, but float on the surface of it, deriving their whole aliment and support from it. Dung is advantageous to the growth of plants, as affording heat as well as water.

It would appear from the experiments we have detailed that the influence of the earth in supporting vegetation is almost totally confined to the conveyance of water.

Catching Aquatic Birds.—The following simple but ingenious method of catching aquatic birds is used in Mexico by the natives. The lakes of the Mexican vale, as well as others of the kingdom, are frequented by a prodigious multitude of ducks, geese, and other water birds. The Mexicans leave some empty gourds to float upon the water, where those birds resort, that they may be accustomed

to see and approach them without fear. The bird-catcher goes into the water so deep as to hide his body, and covers his head with a gourd: the duck comes to peck at it, and then he pulls them by the feet under water, and in this manner secures as many as he pleases.

The Velocities of Wind.—Mr. John Smeaton, the late celebrated engineer, has given in the Philosophical Transactions, vol. 51, the velocities of wind, corresponding to the usual denominations in our language. These are founded in a great number of observations made in the course of his practice in erecting wind-mills, and are as follow:

Light airs	from	1	to	3	miles per hour.
Breeze	—	4	to	5	miles do.
Brisk gale	—	10	to	15	miles do.
Fresh gale	—	20	to	25	miles do.
Strong gale	—	30	to	35	miles do.
Hard gale	—	40	to	45	miles do.
Storm	—	50	to	60	miles do.
Hurricane	—	80	to	100	miles do.

Methods for preventing the Decay of Wood.—The contact of water and air are the chief causes of the decay of wood,—therefore, if any means can be devised to prevent the access of air and moisture the wood may be secured from decay. This principle may be illustrated by supposing a cylinder of dry wood to be placed in a glass or case, which it exactly fills, and the two ends of which are, as it is called, hermetically sealed, or entirely closed. Who will doubt that such a piece of wood might remain, so enclosed, in the open air for a thousand years unchanged.

To exclude air and moisture, various expedients have been employed; the most common is covering the wood with a coating of paint, or oil colour, which is with difficulty penetrated by air or moisture; but the composition which experience has proved to be the best adapted for the preservation of wood from both species of decay, (viz. the wet and dry rot), is as follows: melt twelve ounces of rosin in an iron pot or kettle; when melted, add twelve ounces of roll-brimstone; and just when both are in a liquid state, pour in three gallons of train, or whale oil. Heat the whole slowly, gradually adding four ounces of bees' wax, cut into small bits; frequently stir the mixture, and as soon as the solid ingredients are dissolved, add as much Spanish brown, or red or yellow ochre, or any other colour, (first ground fine with some of the oil), as will give the whole a deep shade. It will now be fit for use. Lay on this paint or varnish as hot and thin as possible; and some days after the first coat becomes dry, give a second. These coats will preserve planks, &c. for ages. What remains unused will become solid on cooling, and may be re-melted for future occasions.

"Carrots are extremely valuable when applied as food to cart-horses; when properly fed with them, they are in the greatest health and vigour, and their coats are as fine as the best groomed coach horses, even in the depth of winter, and when exposed to the

inclemency of the season in a straw yard. For home consumption I have invariably found them to pay more, by one third, when given to horses, than when employed in feeding cattle."—*Mason on the Culture of Carrots.*

AGRICULTURE.—"Worn out ploughed lands are renewed by the intermixture of the fresh soil occasioned by deep ploughing, and the proof is visible in many succeeding crops of corn, grasses, &c."

A FEW CONCISE DOMESTIC HINTS.

To keep Moths from Clothes.—Put amongst them a little black pepper in grains.

To remove Stains from Black.—Dip the part in a strong decoction of fig leaves.

To remove Stains of Wine from Muslin.—Spread on it a paste made of soft soap and whiting, let it remain a short time, then wash it away.

To remove Grease from Clothes.—Use French chalk, or a strong solution of pearl ash.

To remove Ink Spots from Mahogany.—Rub over the stain, occasionally, a little muriatic acid, (or spirits of salts) till it disappears.

To recover Water, that has a bad Taste or Scent.—Put in a small quantity of magnesia, and agitate it.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1822, 1823.

FAMILY OR PORTABLE MILL.—To the person who shall invent and produce to the Society, a mill for grinding corn, for the use of private families, or parish poor; the construction to be simple, the mill to be easily worked, and superior to any hitherto in use.—The Gold Medal, or Thirty Guineas.

PREVENTING EXPLOSIONS IN STEAM ENGINE AND OTHER CLOSED BOILERS.—To the person who shall invent and discover to the Society, a method of rendering close boilers used for steam engines and other purposes, safer than any now in use, and less liable to accident from explosion. The Gold Medal, and not less than Thirty Guineas.

PREVENTING THE WATERING OF PLAIN SILKS.—To the person who shall invent a method of preventing plain silks from being watered in the loom, without the use of a knee roll. The Silver Medal, or Fifteen Guineas.

TO OUR READERS AND CORRESPONDENTS.

THE virgin productions of the mechanical B, are so much to our taste, that we are anxious to sweeten our pages with a further supply.

The subject of W. S's. communication is well adapted to our publication, but its great length precludes our inserting the whole. If the writer would permit us to leave out the introductory matter, we shall be happy to avail ourselves of it in the next number.

The drawing and description of "An Improved Common Lock," sentt o us, we are under the necessity of declining the insertion of; I. C. L. is not perhaps aware that such a lock would cost more to make, than one of Barron's Patent Locks, which is infinitely more secure. The key would be so extremely weak as soon to become useless.

[*To be continued every* FORTNIGHT.]

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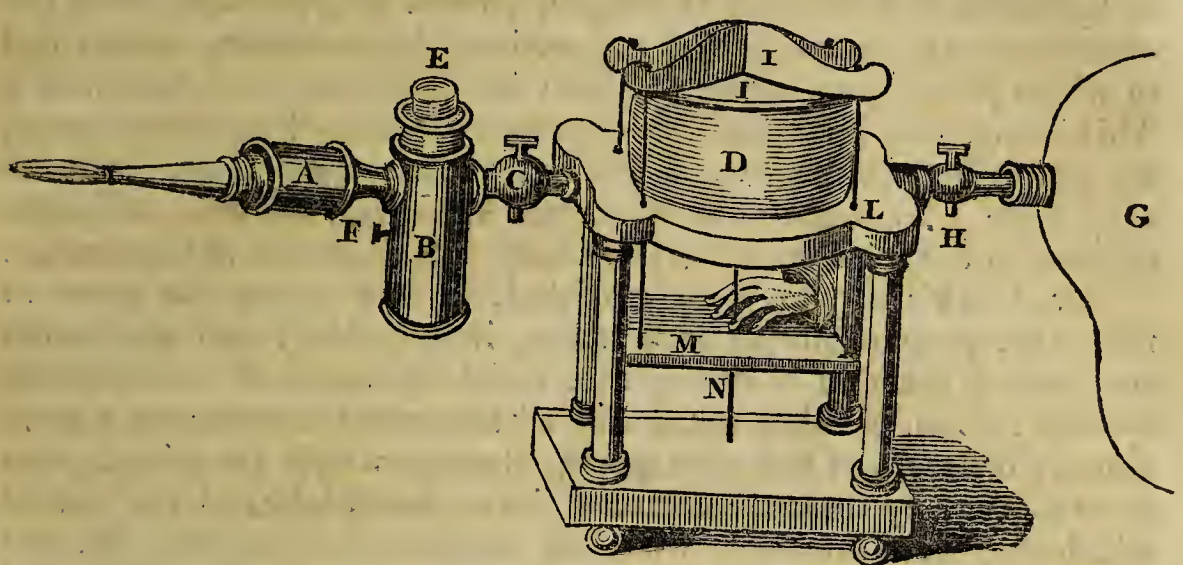
REGISTER

OF

THE ARTS AND SCIENCES,

IMPROVEMENTS & DISCOVERIES.

No. 9.] SATURDAY, FEBRUARY 7, 1824. [Price 3*d*.



MR. GURNEY's BLOW PIPE.

FOR BURNING THE EXPLOSIVE GASES WITH SAFETY,

And applying the Heat produced to Chemical Analysis and Manufacturing Processes.

We were much pleased at witnessing the simplicity, and astonished to observe *the immense power of the above Instrument,* when first introduced to our notice at the Surry Institution; and we have seen with satisfaction the successful uses that have been made of it, by many of our scientific friends, in their several experiments since that time: and as the instrument appears to be of great interest and importance generally, we shall lay a short account of it before our readers.

Since the first discovery of certain inflammable gaseous bodies, numerous attempts have been made to construct an instrument by which the heat produced by their combustion might be successfully applied to manufacturing processes, or to scientific research. So valuable, indeed, has the construction of such an instrument been considered, that it has engaged the attention and study of some of our most scientific men for a number of years. Perhaps the known fact, that hydrogen gas mixed with oxygen furnished an explosive compound, led to the suspicion that very intense heat must be liberated by their sudden union; which was proved to be the case to an almost incredible extent, from experiments first conducted in America. The force of these gases, when exploded, is so prodigious, that it seemed to be a task of no ordinary difficulty to render them manageable; until, at length, Dr. Hare, of Philadelphia, contrived a method of

mixing them as they issued respectively from two jets, and burned them at the point of contact. (Our readers are aware that neither of these gases are explosive alone, and only become so by their mixture.) By these means Dr. Hare succeeded in producing a more intense heat than had ever been obtained before, except by the concentration of the sun's rays by large and powerful lenses.

Chemists, however, soon found that the heat produced was materially affected by the *proportions* in which the gases were mixed; and that the greatest intensity of heat was obtained by two volumes of hydrogen united to one of oxygen, (which we, perhaps, need not observe are the materials and proportions that constitute water, and in which proportions alone they can be conducted into that fluid.) This interesting invention was afterwards modified in various ways, for mixing and *burning* the gases in their due proportions, but with very little advantage. An important improvement was at length effected in the instrument by Dr. Clark, the Professor at Cambridge.

Dr. Clark's improvement consisted, in first mixing the gases in the exact proportions to form water, in a bladder; and afterwards condensing them in a strong iron chest by means of a condensing syringe; to an opening at the end of this chest he attached a great number of layers of fine wire gauze, through which the mixed gases were driven, by their elastic force, into a small tube, at the end of which they were inflamed, when the instrument was used. By this arrangement he obtained a much greater heat than had been effected by Dr. Hare's invention, and by which he made a great number of experiments highly interesting to science. Unfortunately, however, for the general adoption of his plan, it was soon found that his instrument was unsafe to use;—*that the wire gauze would not prevent the explosion of the gases*;—that in several cases, when used by the most cautious and experienced operators, the instruments were bursted. The explosion of it is said to be so tremendous, as to have been compared to the bursting of a bomb-shell; the fragments of the iron chest being driven with the greatest force in all directions. The Doctor, satisfied of the inefficacy of the wire gauze in preventing explosion, but still, justly appreciating the value of his Blow-pipe for scientific investigation, and possessing a strong and persevering mind, was unwilling to give it up. After trying various plans to render it safe, he found himself obliged to preserve the operator from destruction by means of a brick wall, placed between him and the explosive iron chest, the gases being conveyed through a tube which was passed through the wall. In this attitude, and within this fortification, this formidable instrument was found by Mr. Goldsworthy Gurney, when he applied his ingenious mind to its improvement; and we are happy to say that the most complete success has attended his endeavours: he has produced an instrument, that every scientific man must acknowledge to be the most valuable and important ever invented, for scientific investigation, as well as for various operations in the arts.

Mr. Gurney's experiments with his new Blow-pipe have been very numerous, and highly interesting,—not only as connected with

this subject, but equally if not more important as connected with other branches of chemical science. Our limits prevent our going much into particulars on this head; the experiments are detailed in the Lectures published by Mr. Gurney, and it is but just to acknowledge that they have afforded us much valuable information.

Mr. Gurney has proved, by direct experiment, that the flame from a mixture of oxygen and hydrogen gases will pass through successive layers of the smallest wire gauze;—through the smallest apertures made through lead;—through plaster of Paris;—through pipe-clay;—through the natural pores of cane;—and through those of Honduras mahogany. He has satisfactorily shewn that no means have hitherto been adopted, capable of preventing the explosion of these mixed gases under certain circumstances; and has thus confirmed the justness of Dr. Clark's fears, in regard to the great danger attending the use of his instrument.

One of the principal advantages attending the use of Mr. Gurney's Blow-pipe, consists in its being *perfectly safe*, which Mr. G. has repeatedly proved before numerous bodies of persons, by intentionally bursting it in their presence; on one occasion, at the Surry Institution, and recently (as we have been informed) before the Society of Arts. Every apprehension of danger being thus removed from the mind of the operator, he is enabled to give his undivided attention to the changes and effects that are taking place in the substance operated upon; and whilst coolly examining, and noting every circumstance and phenomenon, a slight pressure with one hand is all that is requisite to produce a degree of heat of any required intensity. We shall now proceed to describe the machine, as represented in the preceding engraving.

A is the safety chamber, B a water trough, through which the gas is made to pass from the gasometer D, by the stop cock C, through a tube which reaches to the bottom of the water trough; E is a cork, fitted into the neck of the same, from which it is thrown out should an explosion take place on the surface of the water; F is a gauge, to indicate the necessary height of the column of water in the trough; G is a transferring bladder, which is made to screw and unscrew to and from the stop-cock H, and for supplying the gasometer with the gases, which may be charged and recharged at pleasure by an assistant during its action, so as to keep up the most intense flame, for any length of time. A valve is placed between the gasometer and the transferring bladder, which prevents the return of the gas; I I is a light wooden, or stiff pasteboard cap, which combines sufficient strength, with great lightness, so that in case an explosion of the gasometer should happen, it is merely thrown a short height into the air by the force rupturing the strings which connect the cap to the press board. To these strings are attached small wires, which pass through the table of the instrument, as at L, into the press board below, where they are secured; this press board is kept in an horizontal position by the stand, so that when the requisite pressure is given to it, the cap I I is brought to bear equally on the gasometer D. The gasometer bladder, (or silk bag) is tied to a piece of bladder,

which screws into a long tube, laid into and across the table, which permits it to be unscrewed at pleasure from the body of the instrument, and immersed in warm water, when it requires softening; affording also the means of fixing on another bladder if any accident renders it necessary. The stop-cock of the charging bladder G is fixed at one end of the tube just described, and the stop-cock of the water trough on the other.

To operate with the instrument, pressure by the hand is applied to the press-board, which draws down the cap I I on the gasometer D, and forces the gas which it contains through the stop-cock C, through the water tube and safety chamber A, to the jet at the end where it is burned. When the pressure on the press-board is too slight, or when the hand is taken off, the flame returns into the safety chamber and is extinguished. When it is required to suspend the operation, the hand need only be taken off from the pressing-board, the water in the trough acts as a self-acting valve, in preventing the escape of the gas from the instrument, and saves the necessity of turning the stop-cock. A silk tube is attached to the end of the tube before described in the water trough, which prevents the splashing of the water, sometimes occasioned by unskilful management.

The ease and confidence with which this instrument may be used, and its wonderful power in reducing, almost instantaneously, the hardest and most refractory substances, cannot fail to excite in every beholder the warmest admiration of the invention; and it is but just to acknowledge that Mr. Gurney has, by his ingenuity and perseverance, imposed a deep obligation upon the chemist, the philosopher, and the artizan, who may now avail themselves of the astonishing powers of an oxy-hydrogen Blow-pipe, not only without any personal risk, but even without the apprehension of any.

We shall now conclude our account by mentioning some of its effects. Gun flints are by it instantly fused, and formed into a transparent glass; (but owing to the rapid expansion of the water of crystallization which cause the flints to break and fly off in pieces, it is recommended that they be first deprived of it by calcination.) China melts into a perfect crystal. All kinds of porcelain are readily fused; previously assuming a beautiful white vitrified appearance. Rock crystal is quickly melted, giving out a beautiful light. Emerald, sapphire, topaz, beryl, and all the other precious stones, melt before it into transparent glassy substances. Barytes, strontia, lime, allumina, exhibit very striking and beautiful phenomena. Magnesia fuses into hard granular particles, that will scratch glass. The metals (even platina) are *all* quickly fused by it. A steel file, brought into contact with the flame, fuses and scintillates in the most beautiful manner, forming a magnificent fire-work. All descriptions of stones, slates, and minerals are melted, sublimed or volatilized, by its all-subduing power.

SUSPENSION BRIDGES OF IRON WIRE, AT GENEVA.

These Bridges have been constructed upon the well-ascertained fact, that a small wire of iron is capable of supporting a much greater weight in proportion to its size than a larger cylinder of the same metal. In a former number of our work we noticed some experiments on this subject, tending to shew that this increased tenacity or strength of cohesion was produced by the operations of hammering, rolling. and drawing; but the immediate cause of this effect we have never seen accounted for; to us it appears that the metal is rendered more compact and solid by the processes just mentioned, the particles being brought into closer contact by compression, increasing thereby its cohesive force. Whether this condensation really takes place may be easily proved by measuring in a proper vessel containing water, two equal weights of the metal, one in the state of bar iron, and the other as fine wire.

Notwithstanding the numerous experiments made in this country, all confirming the same fact, Colonel Dufour, who was the engineer employed in the work, determined to satisfy himself by repeating the experiments, which he did with great accuracy. He found that iron wires of from one to four millimetres in diameter, supported at least 132 lbs. for each square millimetre of their section; those of six millimetres from 88 to 100 lbs. per square millimetre, and larger cylinders of iron from 55 to 60 lbs. only, which sufficiently demonstrate the great advantage of employing wire in preference to bars of iron in Suspension Bridges, as a greater tenacity is acquired, with only half the weight of metal.

The Bridges are thrown across two ditches of the fortifications of Geneva; one of these ditches is thirty-three feet deep, and one hundred and eight feet wide; the other is twenty-two feet deep, and seventy-seven feet wide; they are separated by a part of the works called the Countergarde, which is a bank seventy feet wide. On the city side, at the edge of the first ditch, is erected a stone building, which serves as a point of attachment for the wires, likewise as a gate to the city, and a station for those who have the bridge in charge; on the Countergarde another piece of masonry is erected, which serves as a point of support to both bridges; a third building of a similar kind is erected on the exterior bank, which serves as an outer gate, and forms the support for the end of the outer bridge. The wire employed, is that small size called in commerce No. 14; it is made up into lengths or bundles, containing one hundred wires each, and three of these collections are on each side of the Bridges, or rather *Bridge*, as the line of suspension proceeds uninterruptedly across both ditches, and over the intervening bank of the Countergarde. Each single wire was first stretched by a weight of 220 lbs., then formed into bundles of one hundred each, which were united by iron ties at regular distances, and afterwards bound in their whole length, by rolling round them iron wire, which gives to them the appearance of cords. These bundles are firmly attached to a strong plate of iron, well secured in the stone building before mentioned; from thence

they proceed across the first ditch, then over the stone support on the Countergarde, over the second ditch, and over the standard on the opposite bank; they are then finally made fast to iron bars, which are attached to plates, that are loaded with masses of stone, and buried in the earth. From the six principal lines before described (three being on each side of the Bridge) other lines descend, consisting of only twelve wires bound together, which are attached to the traverses, or those pieces of wood which form the bases of the Bridge; planks are then laid across these traverses, which form the footway.

This Bridge was planned and executed by Colonel Dufour, in the short space of six months; and costing even less than the estimate he had given, of 16,000 francs (£666 : 13 : 4 English.)

Before constructing the Bridge just described, Colonel Dufour made a model of one, thirty-eight feet long, and having only two lines of suspension, which were composed of twelve wires to each, ,073 of an inch in diameter. The footway was constructed with wooden traverses, which were hung from the lines of suspension, by only four single wires, two at each end. This Bridge was subjected to the roughest trials by numbers of persons who were curious to examine it, such as jumping, marching, &c. but without the least accident or failure occurring.

" To the Editor of the Register of the Arts and Sciences, &c.

" SIR,

" IN the Pistons which you obliged me by inserting in the last number of the REGISTER, I remarked that there was a defect, viz. that the side only on which the pressure was would be steam-tight; this I have since thought may very easily be remedied. In *Fig.* 1 and 2, (those with oil) let the solid part D D be perforated in three or four places, this, by effecting a communication between the oil in the upper and lower parts of the Piston, allows the pressure exerted on either side to operate equally on both. In *Fig.* 3 the Piston-rod must be allowed to slide through every part of the Piston. In this case, the steam or pressure upon the upper surface *squeezes* the whole Piston upon the lower nut of the rod, and vice versa. This, I think, will be easily understood by a reference to the drawing, and appears to me to remove the objection effectually.

" There were a few errors in the description of these Pistons, in the last number, which, whether they owe their origin to your own devil, or to the imps of my pen, I should feel much obliged by your noticing. In *Fig.* 3. ' the form of the solid part D D is such, that the plate A A cannot possibly descend; the corners of the solid part next the space left for the descent of the plate should *not be rectangular*, but of the same slope as the sides of the plate.' In line the second of the description, for ' had ' read ' have exercised.' Page 117, line the seventh, for ' by driving in the bolts *b b*—as metallic Pistons are generally preferred. In *Fig.* 3, &c.' read ' by driving in the bolts *b b*. As metallic Pistons are generally preferred, in *Fig.* 3, &c.' This is but a mistake in punctuation, but most materially

alters the sense. In the next line, for 'the stuffing' read 'their stuffing.' The correction of these will confer a favor, on, Sir,

"Your's, &c.

"*27th January*, 1824. "E. A. B."

[We readily insert this explanatory letter, and we avail ourselves of the occasion, to state what in strictness should have been before noticed. We are ready and anxious to give every assistance and facility in our power to the promulgation of opinions upon matters of science; but we beg that it may be most distinctly understood, that we shall in no case consider ourselves answerable for, nor as in any degree adopting the notions which any correspondent may seek to put forth through the instrumentality of the Register; and we cannot, we think, better evince our impartiality, or our desire to give a stimulus to the mind of genius than by giving publicity, and in cases which shall need it, the means of illustrating its ideas upon the subjects which form the grand aim of our publication, although such ideas may run counter to those which we ourselves may entertain.]

MR. BELENGER'S PORTABLE ICE-HOUSE may be easily and cheaply made. Take an iron hooped butt or puncheon, knock out the head, and bore a hole in the bottom, of about an inch diameter: place inside of it a tub, of a similar form to the common churn, supporting it upon two pieces of wood, to raise it from the bottom of the puncheon. The tub should have a cover, well fitted to it, having on the under side a few small hooks, to hang on the bottles, while under the operation. Over the lid of the tub, place a bag of pounded charcoal that will cover it entirely; and over all, a lid to fit the head of the puncheon. The machine thus prepared is to be buried in the earth, in a dry cellar, leaving only about a fifth part above the ground. The earth should be dry, wet ground not answering. The inner tub should then be nearly filled with pounded ice, or snow, and the apparatus is completed.

When it is wished to make Ices, the tubs are to be uncovered, and the vessels containing the liquid to be frozen, to be hung upon the hooks before mentioned;—the whole is then to be closed up, and left for half an hour, by which time the congelation will be effected.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"THE long continuation of the fine weather threatening to deprive my sons of their favourite winter's amusement, skating, it has occurred to me that I have somewhere heard of a sort of skates upon little wheels, that are used in the same manner for passing over any hard level surface, and that by the means of such instruments, my boys might (owing to their novelty) derive greater pleasure from wheeling about with them over a large paved yard that I have, than from skating in the ordinary way over the ice. Some information on

this head, particularly where the skates are to be procured, will much oblige, a constant Reader,

"*Buckingham,* "P. W."
"*22nd January,* 1824.

We have no doubt that our correspondent's paternal feelings will be well pleased with the security afforded by the improvements at which he hints. The Volito, the succedaneum of the skate, is very simply constructed, being nothing more than a single line of *wheels,* as exhibited in the engraving underneath, placed one before the other instead of one solid piece of iron. The inventor and patentee is a Mr. Tyers, in Piccadilly, of whom they may, doubtless, be procured.

TYERS'S VOLITO.

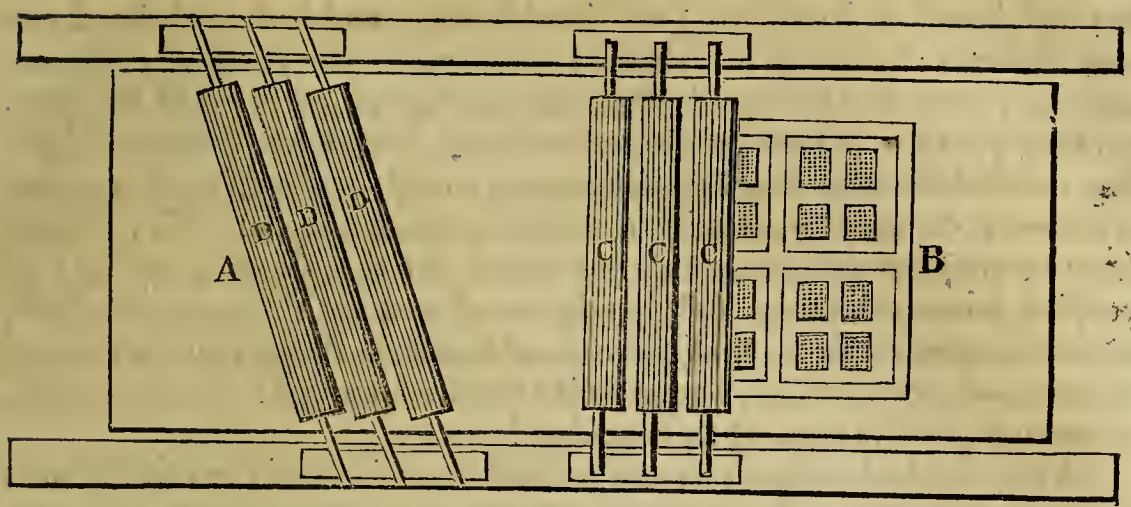
We intended some months since to have given an account of this pleasing little invention for the information of our *country* readers (those in London, being generally very familiar with it) and had had an engraving made for that purpose, but it was by some inadvertence omitted.

IMPROVEMENTS IN PRINTING PRESSES.

THERE are few subjects upon which mechanical genius has been exercised with greater success than in the construction of that admirable and beautiful machine, the Printing Press. A week scarcely passes without our noticing some new ingenious contrivance, for increasing its powers and usefulness. Several of our most scientific mechanics, with a just sense of its vast importance, of the mighty effects of this fountain of intellectual light, seem to be exerting their great abilities, and emulating each other in its improvement.

The specification of the patent granted to Mr. Augustus Applegarth, for several improvements in printing machinery is now lying before us. It embraces five distinct points. The first consists, in applying, to such Printing Machines as have flat tables for spreading the ink upon, rollers that pass *diagonally,* instead of *directly,* across the surface, by which the ink is spread more regularly and uniformly. The second improvement is in rendering the ink table or distributing surface, flexible. The third is a method of inking the form of types, by means of a system of rollers, connected to endless bands or chains. The fourth is in the employment of a cylinder with flattened sides, or of a prism of any number of sides, as the platten, or pressing surface. The fifth consists in a revolving tympan frame, carrying a number of tympans, for the purpose of receiving the sheets of paper, and for conducting them into the situation to receive the impression.

The first mentioned of these improvements is so extremely simple, as to be perfectly understood at the first glance.

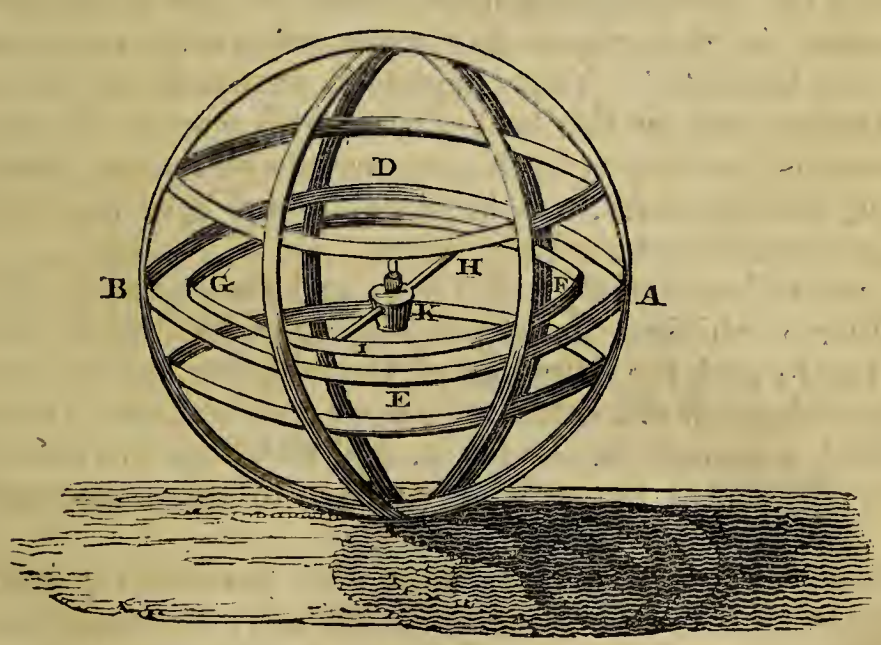


MR. APPLEGARTH's FIRST IMPROVEMENT.

A is the ink table or flat surface, on which the ink is spread and distributed. B is the form of types. C C C are the rollers for communicating the ink to the types. D D D are the distributing rollers placed diagonally across the ink table, their pivots resting in slots in the carriages. The table is made to slide backward and forward, causing by that motion, the rollers to revolve, which are nicely adjusted, in contact with the table, so as to press evenly on the surface of it; those in the oblique position traversing it laterally, and spreading out the ink, which is uniformly taken up by the inking rollers as they revolve over the table, and by them communicated to the types.

What will probably render this simple invention of great utility and advantage, is its ready adaptation to the Printing Presses generally in use.

(The Subject to be continued at the earliest opportunity.)



THE ROLLING LAMP.

Why should the world regret the golden age—why eternally deplore the degenerating spirit of the present? why should we sigh for Greece of old, or mourn for the men who made her great? What is

there of dearth in living art that should make us blush and bend our eyes towards the earth for shame? Where is the trumpet of Fame, and wherefore do the sounds that echo to her notes thrill of the days of other years? Where is divine Art and her sister Science? have they quitted for ever this hypochondriac world—is their freshness decayed—or do they still hold a dwelling among men? Why should there be wailing and gnashing of teeth for the times gone by; or weeping among the sons and daughters of men for the master-spirits, mighty and marvellous, that were wont to adorn this green earth, now no more—is its excellence gone or its worth departed? Gentle reader, we cannot for the soul of us conceive!

When we look around us and behold the efforts of the mighty men of the present day, all animated with the one great object—the progress and the glory of science, stimulated by virtuous ambition (in some cases and abominable lucre in others), and filled with the holiest desires to attain unto exceeding perfection; we cannot but lift up our eyes in thankfulness, and think that all is as it should be.

Glance we around civilized Europe, and what do we see? there is scarcely a branch of art that has not arrived at the great goal. We no longer think of invidious distinctions, and speak of the *liberal* arts; the thought is exploded quite, every thing is an art, and they are all liberal—each department has its votaries and professors—mankind is now a race of artists;

"All the world is art—the men and women *artistes*,"

and, whether we regard the painter, the perruquier, the poet, or the pugilist, the sculptor, or the scowerer, the diallist, or the dancer, the cook, or the clownist, we see in all and each but so many involutions of general science, but so many *artistes*, great and inimitable, ripe for Fame, and panting for the laurel.

Among this multitudinous mass, there are few whose pretensions are becoming in the present day more universally recognized than those of the lampiste! Your lampiste is an artiste of the very first possible water, and for this best of all mortal reasons, lamps are now in progress of arriving at such consummate perfection, that the sun, the moon, and the stars, will be to be, by and bye, regarded but as simple accessories and auxiliary lights.

The marvellous beauty, the taste, and the ingenuity which have been hitherto exhibited in the progressing of this species of science have led us to seek the attention of the lampiste, in the hopes that he will avail himself of a certain luminous crotchet, which a short time since found a domicile in our brain, and which we are about to propound in allusion to the drawing prefixed to these observations, as another grade towards the climax.

It struck us that if a lamp upon this particular principle were gotten up in a handsome and magnificent way, the frame work to be of cut, polished, and ornamental glass, the thing would form a most elegant, chaste, and resplendent appendage to the drawing room table! need we say another syllable? We could very easily dilate upon the fascinating appearance it would have, in the rays of a powerful light

pouring through the chrystal circles, and the effulgence of the prismatic tints it would display. We leave to Mynheer Lampiste the reducing to practical illustration the position we assume.

It is easily constructed: A B we will suppose is a machine with two moveable circles, D E, F G within it, whose common centre of motion and gravity is at K, where their axes of motion cross one another. If the lamp K C is made pretty heavy and moveable about its axis H I, and whose centre of gravity below K be fitted within the inner circle, the common centre of gravity of the whole machine will fall below K, and by reason of the pivots A, B, D, E, H, I, will be always at liberty to descend; hence, though the whole machine be rolled along the table, or moved in any manner, the flame will always be uppermost, and the oil cannot be spilled. The Lamp may be a handsome brass or gilded ball, and the whole effect would be delightful.

THE ELEMENTS OF NATURAL PHILOSOPHY,

(Continued from page 108.*)*

No. 7.—Hydrostatics,—or the Laws of Fluids.

The immersed part of any solid that swims is equal in magnitude to so much fluid as is equal in weight with the whole solid. For if the whole solid were taken away, and the place of the immersed part supplied with an additional quantity of fluid, all part of the former fluid would continue as they were.

Wherefore, if the specific gravities of the solid and fluid be equal, no part of the solid will emerge above the surface of the fluid, but will remain suspended at any depth where it may be placed.

All solids that swim, therefore, or as may be suspended in any fluid, communicate their whole weight to the fluid.

The magnitudes of the immersed parts of several bodies floating upon the same fluid, are in proportion to the weights of the respective solids; because the magnitudes of such quantities of the fluid as are of an equal weight with the several solids, are in proportion.

The magnitude of the immersed part of the same solid floating upon different fluids is reciprocally proportional to the specific gravity of each fluid; inasmuch as equal weights of several bodies are reciprocally as the specific gravities of those bodies.

If a body be immersed in several fluids the weight which it loses in those fluids are as the specific gravities of the fluids: for each weight answers to an equal bulk of each particular fluid.

Specific Gravity is the relative weight which equal bulks of different bodies have to each other.

If a body, as we have before shewn, be immersed in a fluid whose bulk is lighter than the body it must sink. If it remain suspended it will lose as much of what it weighed in air as its bulk of the fluid weighs; so that all bodies of equal bulks which would sink in fluids lose equal weights when suspended therein; and unequal bodies lose in proportion to their bulk.

The *hydrostatic balance* is an instrument used for finding the specific gravities of bodies.

It varies but little from the common balance—to the bottom of one of the scales (which is raised considerably higher than the other, in order the more conveniently to suspend the body to be weighed) is attached a hook, upon which, by means of slight silk or horse hair, it is hung, so that the body may be immersed in the vessel beneath without wetting the scale.

If a body thus suspended under the scale at one end of the balance be first counterpoised in air by weights in the opposite scale, and then immersed in water, the equilibrium will be immediately destroyed; then, if as much weight be put into the scale from which the body hangs as will restore the equilibrium without altering the weights in the opposite scale, that weight which restores the equilibrium will be equal to the weight of a quantity of water as large as the immersed body; and if the weight of the body in air be divided by what it loses in water, the quotient will shew how much that body is heavier than its bulk of water.

By this method the specific gravities of all bodies that will sink in water may be found, first weighing the body in air, then in water, and dividing the weight in air by the loss in water.

As to those, however, which are lighter than water, the following method must be taken: A sort of pincers or tongs must be provided to retain the substance to be examined under water. Weigh the body first in air, then, having balanced the tongs in water, fix to it the body to be weighed, which being lighter than water will raise the tongs, and cause the other scale to preponderate. Observe the loss of weight of the body in water and proceed as before.*

To find the specific gravity of several solids specifically heavier than the fluid in which they are immersed, we must proceed thus: As the specific gravity of the fluid is to that of the solid, so is the weight which each solid loses, to its entire weight in air, because the weight lost answers to such a bulk of the fluid as is equal in magnitude to the solid.

The specific gravity of a solid lighter than the fluid in which it is immersed may also be found by joining it to another body which is heavier than the fluid; so that the whole compound may be also heavier. Then weighing the heavier body and also the compound separately in air and water, let the lost weight of the heavier body be subtracted from the lost weight of the compound, and—as this difference is to the weight of the lighter body in air, so is the specific gravity of the fluid to that of the lighter body.

The specific gravity of a fluid is found by taking any solid body whose specific gravity is known, and then it will be—as its absolute weight in air is to the difference of its weight in air and water; so is the specific gravity of the solid to that of the fluid.

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* For finding the specific gravity of fluids recourse must be had to the hydrometer, a description of which is the less necessary here as it may be found in any scientific work.

And the weight of any body, knowing its solid content, may be ascertained by finding its specific gravity by proceeding thus:—as one solid foot is to the solid content of the body so is its specific gravity to its weight.

We have extended this paper to too great a length in the present number to append to it a tabular view of the specific gravities of various bodies; this, however, shall appear in our next.

JAMES CROSS.

We observe that a Memorial has been presented to the "Board of Trustees for the Improvement of Manufactures in Scotland," on behalf of this humble and modest artisan, for some remuneration from the public purse, for the improvements and inventions which he has from time to time discovered and published to the world, and particularly on account of a machine which is calculated to supersede manual labour, so far as regards draw-boys, in the manufacture of what are called harness goods. The machine has been examined by a committee of operative weavers in Edinburgh, who have pronounced that it is most eminently calculated to perform every variety of harness loom-work—a long-sought-for desideratum in the art for which it is intended.

We have long thought and felt that some protection should be given by the laws to the poor and unfriended, whose genius and talents have been wasted, and for ever lost to themselves and to their families, whilst their wealthier neighbours have, perhaps, laid upon their struggling and unsupported exertions, the foundation of riches, honour, and notoriety; and left the needy and unpitied artisan to sickness, sorrow, and a broken spirit. To such persons the law of patent-right is worse than nothing; and *Deo volente*, we will in an early subsequent number throw out a thought or two which has from time to time occurred to us upon the subject of the cruel privations to which ingenious poverty is subject.

CHEMISTRY.

New Chemical Test Papers.—We observe in the Journal de Physique an account of two new coloured test papers, which have been in use by M. C. Pagot de Charmes, for a number of years in testing for acids and alkalies. One of them is obtained from the violet-coloured skin which covers the root of the small radish; the other from the skin of the common red radish. M. de Charmes directs, that the skin of the small radish should be scraped off with a knife, and as the colour is soon altered by the air, it should be collected quickly, be put into clean linen and compressed, by which means a fine transparent blue fluid is obtained. This test may be preserved in its fluid state, if kept from the contact of the air; or it may be made into a syrup, or laid upon paper with a brush. Paper thus prepared will preserve its fine azure colour exposed to the air

for a number of years; and forms an extremely sensible test for acids and alkalies. The scrapings from the common red radish require to be bruised in a mortar before they are subjected to pressure; they yield less juice than the small radish, but the tint it affords either in the liquid or on paper is very beautiful, besides being an extremely delicate test. M. de Charmes considers these tests as superior to litmus, by being equally sensible, yet unalterable by the air, as they may be easily procured every where.

New Mechanical Agents.—Sir H. Davy, in conjunction with Mr. Faraday, has lately made a variety of experiments, with the view of ascertaining whether the vapours arising from the liquefied gases might not be rendered available as mechanical agents, in lieu of steam, and be applicable to the same purposes. These experiments having been detailed in a paper, read at the Royal Institution, we have made the following selections from it, considering them to be well deserving the attention of our scientific mechanical readers.

"*Sulphuretted Hydrogen,* which condenses readily at 3° Fahrenheit, under a pressure equal to that which balances the elastic force of an atmosphere compressed to 1-14th, had its elastic force increased so as to equal that of an atmosphere compressed to 1-17th, by an increase of 47° of temperature."

"*Liquid Muriatic Acid,* at 3°, exerted an elastic force equivalent to that of an atmosphere compressed to 1-20th; by an increase of 22°, it gained an elastic force equivalent to that of an atmosphere compressed to 1-25th; and by a farther addition of 26°, an elastic force equivalent to that of air condensed to 1-40th of its primitive volume." Sir H. Davy considers, that the denser the vapour, or the more difficult the gas is of condensation, the greater will be its power under changes of temperature as a mechanical agent, thus;

"*Carbonic Acid,* exerted a force nearly equal to that of air compressed to 1-20th at 12° Fahrenheit, and of air compressed to 1-36th at 32°, making an increase, equal to the weight of 13 atmospheres, by an increase of 20° of temperature; and this immense elastic force of 36 atmospheres being exerted at the freezing point of water."

From the above experiments, as well as others on the same subject, Sir H. Davy is of opinion that "the small differences of temperature required to produce an elastic force equal to the pressure of many atmospheres, will render the risk of explosion extremely small; and," (he continues) "if future experiments should realize the views here developed, the mere difference of temperature between sun-shine and shade, and air and water, or the effects of evaporation from a moist surface, will be sufficient to produce results, which have hitherto been obtained only by a great expenditure of fuel."

Animal Electricity.—Mr. Glover has published the following method of receiving the electrical shock from a cat. Place the left hand under the throat, with the middle finger and the thumb slightly pressing the bones of the animal's shoulder, then gently passing the right hand along the back, sensible electrical shocks will be felt in the left hand. *Phil. Mag.* Very distinct discharges may be obtained,

too, by touching the tips of the ears after applying friction to the back of the cat. It will be hardly necessary, we suppose, to hint how requisite it is that a good understanding should exist between the experimenter and the *apparatus*, lest shocks might be elicited more electric than were to be wished.

New carburetted Hydrogen Gas.—It is stated that Mr. Dalton has discovered a new carburetted hydrogen gas in oil gas, in which it is very abundant. Mr. Dalton calls it super-olefiant gas, as it contains twice as much carbon as olefiant gas.

Flame.—It appears by some recent experiments of Mr. Skidmore, of New York, that the flame of the oxy-hydrogen blow-pipe may be made to burn under water. To this end it is only necessary that the flame should be submerged slowly, so that it may not recede into the vessel. The flame under water is *globular!* wood burns in it, and wires are ignited. Mr. Skidmore thinks it may be employed with success as a sub-marine instrument of naval warfare.

Ammoniacal Gas in Air.—Professor Silliman has observed, that when a large jar of this gas is opened in the air beneath a burning candle, it is so combustible, that as it mixes with the air, it burns with a voluminous flame, forming a beautiful experiment. A small jarfull so opened does not burn, being either not mixed sufficiently with the air, or dissipated or cooled by the vessel.

MISCELLANEOUS ARTICLES.

Many casks of beer are spoiled owing to the Bungs being porous, and thus permitting the gas, or fixed air to escape, upon the retention of which the beer depends for its briskness; and the larger the Bung required, the more difficult to get one sound; to remedy this, place between the Bung and the bung cloth a piece of bladder, large enough to cover the Bung entirely, it will then be found air tight. Probatum est. Yours, &c.

FITZ-SWEYN.

Jardin des Plantes, at Paris.—In this celebrated garden, there are at present no less than 6000 species of the vegetable kingdom under cultivation; all classed and arranged according to the system of Linnæus.

American Tea.—Mr. Mallet is now cultivating the tea plant with success in Louisiana. His plantation is near the river Amite. The bed of shrubs is of considerable extent, and the whole was raised from the seed. The climate appears to favour the growth.

Method of preserving Preparations.—It does not appear to be generally known, that all preparations of animal bodies may be preserved by a solution of muriate of soda, or common salt. If used a *little below saturation*, it will preserve animal substances for an indefinite period at all the temperatures of our atmospheres. This was discovered some little time back by Mr. W. Cooke.

ANTIQUITIES.—The workmen employed in digging the foundation for a building on an estate in Transylvania, in the valley of Hazeg, where stands the ruin of the Roman colony, Ulpia Trajana, discovered, at an inconsiderable depth below the surface, some chambers thirty-six feet long, and about as many broad. Two of these rooms have been entirely cleared of the rubbish, and each of them has a mosaic pavement in perfect preservation. The walls of one have a border composed of wreaths of flowers; in the centre is a painting, with figures as large as life, representing "Priam and Hecuba begging Achilles to give up the dead body of Hector." The painting of the second pavement represents the "Judgment of Paris." It is hoped that farther researches on this remarkable spot will bring to light other interesting remains of antiquity.—*Monthly Mag.*

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1822, 1823.

TEST FOR ARSENIC.—To the person who shall discover to the Society a test for arsenic in solution, superior to any hitherto known. The Gold Medal.

FINE BAR IRON.—To the person who shall make the greatest quantity of bar-iron, not less than ten tons, with coke, from coke pigs, equal in quality to the best iron imported from Sweden or Russia, and as fit for being converted into steel. The Gold Medal, or Fifty Guineas.

CROWN GLASS.—To the person who shall make crown or window glass equally transparent, and as free from green and blue colour as the best German sheet. The Gold Isis Medal. or Thirty Guineas.

STAGE COACHES.—To the person who shall invent and discover to the Society a method of preventing accidents arising from stage coaches. The Gold Medal, or Thirty Guineas.

RECENT PATENTS.

A. BUCHANAN, of Catrine cotton works, for improvements in the mills employed for carding cotton, wool, &c. whereby the top cards are regularly stripped and kept clean by the operation of the machinery. Dec. 4, 1823.

J. PARKES, of Manchester, for a method of manufacturing salt. Dec. 4, 1823.

G. M. GLASSCOTT, of Great Garden Street, Whitechapel, and T. MICHELL, of Upper Thames Street, for improvements in the construction or form of nails to be used in the copper or other sheathing of ships, and for other purposes. Dec. 9, 1823.

T. HORNE the younger, of Birmingham, for improvements in the manufacture of rack pullies, in brass or other metals. Dec. 9, 1823.

WM. FURNIVAL, of Droitwich, and A. Smith, of Glasgow; for an improved boiler for steam engines and other purposes. Dec. 9, 1823.

SIR H. HEATHCOTE, of Surry Street, Strand, for an improvement of the stay-sail generally in use, for the purpose of intercepting wind between the square sails of ships and other square-rigged vessels.

TO OUR READERS AND CORRESPONDENTS.

IF A. Q. would follow our advice, he would no longer pursue his experiments with regard to the *perpetual motion* business.

W. B.'s valuable communication will receive the earliest attention.

Adam's invention is a very clever one, but it fails in one important particular—it will not do.

"*Richard T——'s*" improvements upon the principle of *netting*, seem very clear; we hope he will clear a *nett* profit on them.

We fear we must have used *Zero's* letter as—waste paper.

[*To be continued every* FORTNIGHT.]

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REGISTER

OF

THE ARTS AND SCIENCES,

IMPROVEMENTS & DISCOVERIES.

No. 10.] SATURDAY, FEBRUARY 21, 1824. [Price 3*d.*

THE CHINESE MANGLE,

As a Substitute for the Tread Mill.

When disputes run high, and men are given to contentious purposes, we conceive it to be the duty of every one, invested like ourselves with powers and authority, to calm down the angry passions of the heart with all the soothing sweetness and loving kindness with which it may have fallen to his share to be gifted. It is for that purpose, and under such an impression, that we lay before our readers at the present moment a contrivance, which seems admirably adapted to the two-fold purpose of illustrating the arts, and of allaying the perturbed spirits of belligerent *millers*.

The object which we mainly point at, (were it only for the sake of peace) is the speedy and effectual overthrow, the discomfiture and

abolition of that vilest of all mechanical powers, the tread wheel ;—and of proposing to his majesty's liege and other subjects, as a fit and proper substitute, the establishment of a Chinese Mangle. It appears to us as eminently suited to the purposes in view—as affording a far healthier recreation, and infinitely greater profit,—to say not one syllable of its nutritious properties.

We believe a description of it was given some three or four years back to the English public, by Mr. Waddell, in a communication to the Edinburgh Philosophical Journal; and a friend of ours, lately returned from that 'land of the leaf and bright nankeen,' has presented us with a sketch made on the spot; by which, by the bye, it would seem that no patent improvements have been concocted in the interval—happy country!

A concavity is formed in the floor of the apartment, of a hard and polished wood, into which is placed a roller, with the cloth intended to be mangled round it. The stone (so shaped as to rest on either end while the operator examines his work), is then glided on the roller, and its elevations alternately pressed by his feet, so that the article shall receive an equal pressure upon every part of it. The man supports himself by bamboos, placed in the floor for that purpose, and after a labour of about five minutes, the work is completely finished.

A NEW MUSICAL INSTRUMENT,

Achromatic Trumpet.—Mr. Shaw, of Glossop, in the county of Derby, has invented a new trumpet, to which he has given the above name. It is said that the instrument combines in itself all the brilliancy of tone of the common trumpet, with the mellow richness of the Kent bugle. The principle of its construction is, we have learned, novel; but at the same time applicable to every other of that description of instrument.

"To the Editor of the Register of the Arts and Sciences, &c.

"Sir,

"Should the following remarks be deemed worthy a place in your highly interesting little Work, they will be very much at your service.

"Of all Sciences, Mineralogy requires us to be particularly nice in our operations, as a very trifling mistake might lead to different results, and thereby discourage the operator in his laudable pursuits.

"Borax, that it may answer for some of the nicer experiments with the Blowpipe, should be vitrified. In order to do this, take one ounce of borax, coarsely pounded, put it into a clean crucible, and cover it loosely, put the whole into a furnace, and watch it till it ceases to swell, then augment the heat, and when the whole fuses quietly, take it out, and pour it into a Wedgwood-ware, or metallic mortar, and, when cold, reduce it to an impalpable powder, in which state it is to be used. The use of this article will be found far supe-

rior to the use of common borax, as it will prevent the substance from splitting and flying off the charcoal, to the great risk of the operator's eyes and face.

"The use of prepared borax will also save time, inasmuch as borax is in an unprepared state takes some time to reduce it to the form of glass, which may be done with the vitrified borax almost instanstaneously.

"JUVENIS."

ON DISTILLATION.

Distillation is the art of separating from fluids their more volatile parts by evaporation, and subsequently condensing the vapour into a liquid state. Distillation is not, however, confined to fluids, solid substances are also distilled, but the process is usually called *sublimation:* and the distillation of the gases is chiefly confined to the experimental chemist and philosopher. Our present business is with the distillation of spirits, or alcohol.

Previously to the operation of distilling, those of brewing and fermentation are necessary; the liquid must be brought into the state of wine, or beer, (which is the wine of grain.) Methods have been suggested, and we believe carried into practice, for reducing the brewing and fermentation to a single operation, by which, it is said, the spirit is much improved in quality, as well as augmented in quantity. The practice we are informed is as follows:

To one hundred pounds of malt, reduced to fine meal, are added thirty pounds of wheat meal; twenty gallons of water are then added by degrees, mixing the whole mass thoroughly; fifty gallons more of water, made boiling hot, are then poured upon the mass, and the whole well stirred together. It is then allowed to stand for two hours, afterwards stirred again, and when grown cold, a pound or more of solid yeast is added, and then allowed to stand loosely covered in rather a warm place to ferment.

In London, and its neighbourhood, we understand the process of forming the wash for distillation is the same as in brewing for beer, with the exceptions of the addition of the hops, and that instead of boiling the wort, they pump it into coolers, and afterwards draw it into backs, to be then fermented with yeast. During the fermentation particular attention must be paid to the temperature of the liquid; if it exceeds 77° Fahrenheit, the fermentation will be too rapid, if below 60°, the fermentation will cease. The mean between these is considered the most favourable, and the fermentation must be continued until the liquor grows fine and pungent to the taste, but not so long as to permit the acetous fermentation to commence. In this state the wash is put into the still, of which, it should occupy about three-fourths, and distilled with a gentle fire, as low as any spirit comes over, which is generally until about half the wash is consumed.

The form of the common still is too well known to need any *particular* description; it generally consists of a large boiler made

of copper, and fixed in masonry over a fire place: the boiler has a head, or capital as it is called, which is of a globular form, to which is soldered a neck, which, forming a complete arch, curves downward, and fits into what is called the worm. The worm is a long tube, made generally of pewter, of a gradually decreasing diameter, and is curled round into a spiral form; it is enclosed in a tub, which is kept filled with cold water during distillation.

The Dutch method of making Geneva is said to be as follows: "One hundred weight of malt from barley, and two hundred weight of rye meal are mashed with four hundred and sixty gallons of water, heated to 162° Fahrenheit. When the infusion has been continued a sufficient time, cold water is added until the wort is equivalent to about forty-five pounds of saccharine matter per barrel; it is then drawn off into a back of five hundred gallons capacity, at the temperature of 80°, with half a gallon of yeast. The fermentation immediately commences, and is generally finished in about two days, when proper attention is paid to the temperature of the place. The wash is then put into the still, reduced to about fifteen pounds of saccharine matter per barrel, along with the grains, and receives three distillations, a few juniper berries and a small quantity of hops being introduced to communicate the flavour.

The spirits of the first Distillation is usually called *low-wines;* the re-distillation of the *low-wines,* or *doubling,* produces at first a fiery spirit, milky and crude (which is returned into the low wines); after this the spirit flows perfectly clear and bright; nevertheless, tainted a little with empyreuma; to get rid of which, it generally undergoes another distillation, called rectification, at which time flavouring ingredients are added, to imitate the foreign spirits, such as rum, brandy, hollands, gin, &c. and likewise to form the compound spirits, called carraway, peppermint, cinnamon, cloves, aniseed, &c.

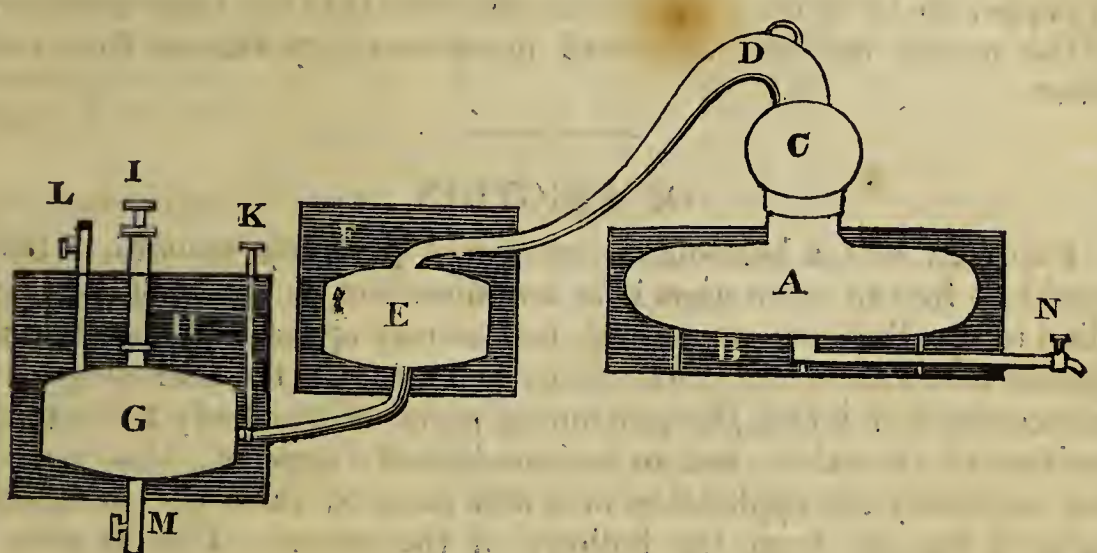
The flavour of malt spirit is said to be much improved, by putting four ounces of finely-powdered charcoal, and four ounces of ground rice into a quart of spirits, and letting it stand for a fortnight, frequently stirring it; upon being then strained it will be found to resemble very closely the flavour of brandy. It has been frequently proved that the muriate of soda (or common salt) thrown into the still in the proportion of about half an ounce to every gallon, will materially improve the taste and strength of the spirit; the viscid matter being fixed by the salt, allows the volatile parts to ascend in greater purity. Some time since, a distiller at Copenhagen, published an account of his having several times distilled brandy and gin from wheat steeped in salt water, by which he uniformly obtained nearly one fourteenth more of spirit, than when he distilled from an equal quantity of wheat, which had not undergone that process.

It is said to be the practice of the distillers in Scotland, &c. to use one part of malted grain, with from four to nine parts of raw grain; rye is said to produce more spirit than wheat, and wheat more spirit than barley.

(The Distillation of Rum, Brandy, Alcohol, &c. in our next.)

DISTILLATION IN VACUO.

That celebrated philosopher and mechanic, the late Mr. Watt, having ascertained that liquids boiled in vacuo at a much lower temperature than when under the pressure of the atmosphere, ingeniously applied this fact to distillation. The discovery led Mr. Tretton to construct a distilling apparatus, which, from its simplicity and economy, is well deserving the attention of the public. The vessels are arranged in the manner of Woolfe's Apparatus, and the cucurbite, or body of the still, is immersed in a water bath, which renders it impossible to overpeut or burn the matter contained therein, which likewise prevents an empyreumatic flavour being communicated to the spirit. The following Engraving will give an idea of the plan upon which it is constructed.



SECTION OF AN IMPROVED STILL,

Exhibiting the Principle of Mr. Tritton's Apparatus, for distilling in Vacuo.

A is the body of the still; B is a water bath, into which the body of the still is immersed; C is the head, or capital; D is the neck of the same, which, curving downwards, is connected with a pipe that enters the condensing vessel E; F is a refrigeratory, or close vessel, containing cold water, for converting into liquid the spirituous vapours, which, having been raised in the still, are contained in the vessel E. From the bottom of the vessel E, a pipe issues for conveying the liquid, and the vapour not yet condensed into vessel G, which, being surrounded with cold water contained in the vessel H, acts also as a refrigeratory, and reduces the whole of the remaining vapour into a liquid state. I is an air pump, for effecting a vacuum in the vessels A E G. K is a stop-cock, for cutting off the communication between the vessels E and G, when the contents of G are drawn off by the cock M, by which means a vacuum is preserved, during that operation, in the vessel E; and the still A L is an air-cock, to admit air into vessel G, to allow the contents to run out at M; N is a discharge-cock to the still A.

It is evident, that without a vacuum being produced, the matter contained in the still can never be heated beyond 212°, that being the greatest degree of heat that the surrounding liquid water is capable of receiving or transmitting. But as this apparatus affords a convenient and easy mode of removing the pressure of the atmosphere, by means of an air-pump, the distillation is effected at the low temperature of 132°, and the regular application of so low a degree of heat cannot fail to produce a spirit of the clearest and strongest quality.

[*Mr. Winter's Distilling Apparatus in our next.*]

Composition of the Bronze of the Ancients.—It appears, from a number of experiments, that the bronze, of which the Ancients formed their weapons, and other articles, consists of 88 parts of copper to 12 of tin; and it is remarkable that the same admixture of the metals has been employed in nations very remote from each other.

OF FRICTION.

Friction.—If a horizontal plane were *perfectly* smooth, a body would be free to move upon it in any direction by the least force applied to it. But however smooth bodies may appear to the eye, numberless inequalities are discoverable by means of the microscope; in consequence of which the protruding parts of one body fall into the cavities of the other, and so become locked together; thus rendering necessary the application of a new force to raise the prominent parts of the one from the hollows of the other. This is what is called *friction*.

Friction is greater in bodies, in proportion to their weight or pressure against each other. It also increases in proportion to the velocity of the moving bodies.

A piece of smooth soft wood, eight pounds in weight, moving upon a smooth plane of soft wood, at the rate of three feet every second, has a friction equal to above two-thirds of its weight. Soft wood upon hard wood has a friction equal to one-sixth part of its weight; and hard wood upon hard wood, about one-eighth part of its weight.

In wood rubbing upon wood, oil, grease, or black-lead, properly applied, makes the friction two-thirds less.

When polished steel moves on steel, or pewter properly oiled, the friction is about one-fourth of its weight—on copper or lead, one-fifth; on brass, one-sixth. Metals have more friction, when they move on metals of the same kind, than when on different metals.

The friction of the wheel and axle is in proportion to the weight, velocity, and diameter of the axle. The smaller the diameter the less the friction.

In the wedge and screw the friction is great. Screws with sharp threads have more than those with square threads, and endless screws have more than either.

A TABULAR VIEW OF SPECIFIC GRAVITIES.

METALS.

Antimony, crude	4,064	Molybdena	4,738
Arsenic, molten	5,763	Mercury, in the fluid state	13,568
Bismuth, molten	9,823	Nickel, molten	7,807
Brass, cast	8,396	Platina, pure	19,500
Cobalt, molten	7,812	Silver, fine	10,744
Copper, molten	7,788	Tin, pure	7,291
Gold, pure, (24 carats)	19,258	Tungsten	6,066
Iron, cast	7,207	Uranium	6,440
Iron, wrought	7,788	Wolfram	7,119
Lead, molten	11,352	Zinc, molten	7,191
Manganese, metallic	6,850		

PRECIOUS STONES.

Beryl, or aqua marine	3,549	Hyacinth, common	3,687
Chrysolite (Brazil)	2,692	Quartz	2,655
Crystal (Brazil)	2,653	Ruby (Oriental)	4,283
Diamond (white Oriental)	3,521	Sapphire (Oriental)	3.994
Emerald (of Peru)	2,775	Spar (sparkling)	2,595
Garnet (Bohemia)	4,189	Topaz (Oriental)	4,011

VARIOUS STONES, EARTHS, &c.

Alabaster, (Oriental white)	2,730	Lapis, calaminaris	5,000
Alumine	2,000	Lime, pure	2.300
Amber	1,078	Marble, white Parian	2,838
Ambergris	,926	Porphyry, red	2,765
Asbestos, starry	3,073	Serpentine, opaque, green	2,430
Barytes	4,200	Silex (flint)	2,660
Brick	2,000	Slate (common)	2,672
Chalk	2,784	Stone, pumice	,915
Gypsum, semi-transparent	2,306	—— Bristol	2,510
Glass, white	2,892	—— Portland	2,496
Granite, red	2,664		

LIQUORS, OILS, &c.

Acid, Sulphuric, concentrated	2,125	Ether, muriatic	,730
—— Nitric	1,589	Milk, cow's	1,032
—— Muriatic	1,194	Naptha, Persian	,753
—— Acetic	1,063	Oil, essential of Turpentine	,870
Alcohol, highly rectified	,829	—— of Linseed	,940
—— half water (or proof spirits)	,943	Water, rain	1,000
Ammonia	,897	Wine, Port	,997

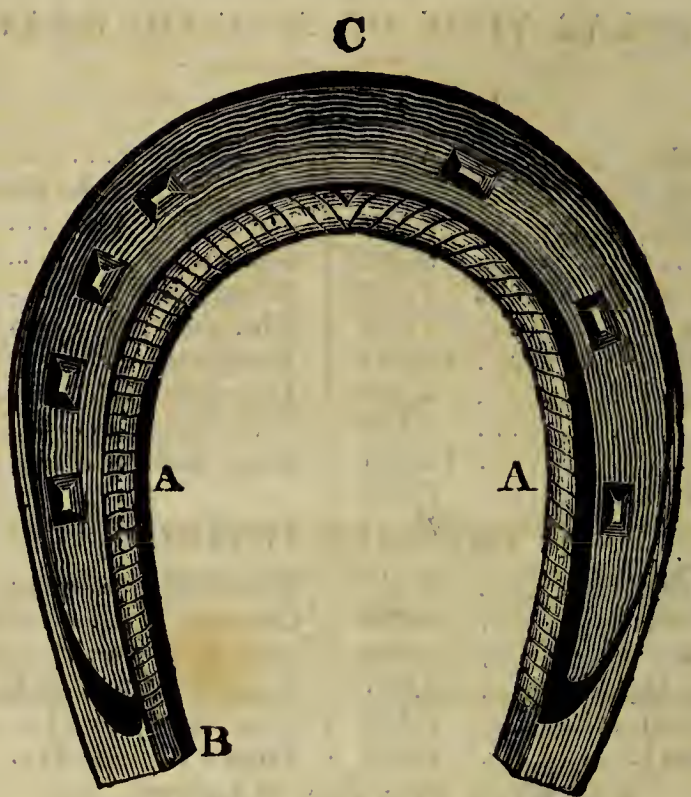
WOODS.

Alder	,800	Lignum Vitæ	1,303
Box	1,382	Logwood	,913
Cork	,240	Oak, heart of	1,170
Ebony, Indian	1,209	Mahogany	1,063

GASES,

ATMOSPHERIC AIR BEING UNITY.

Vapour of hydriodic ether	5,4749	Nitrous oxide	1,5204
—— Oil of Turpentine	5,0103	Carbonic acid	1,5196
Hydriodic acid gas	4,4430	Muriatic acid gas	1,2474
Vapour, sulphuret of carbon	2,6447	Sulphuretted hydrogen	1,1912
—— sulphuric ether	2,5860	Oxygen	1,1036
Chlorine	2,4700	Nitrous gas	1,0288
Vapour, muriatic ether	2,2190	Olefiant gas	0,9784
Cyanogen	1,8064	Azote, or nitrogen gas	0,9691
Vapour of absolute alcohol	1,6133	Oxide of Carbon	0,9569



THE PATENT CAST-IRON HORSE-SHOE.

"*What? Cast-iron Horse-shoes?—Impossible to answer!—Why, a horse shod with them would smash them to atoms over the first stones that he might strike his feet against!*" Some such exclamations, we anticipate, from persons who are not aware that cast-iron may be made as malleable and as soft, almost, as copper, which is effected by a subsequent process, that has recently been much improved upon, called annealing. There are nails made of cast-iron that may be bent, and twisted and curled up, like a piece of wire; and their chief defect is that of being *too soft*; need we, then, doubt the practicability of making horse-shoes tough and malleable, by a similar process of annealing? Our opinion we humbly state to be decidedly in favour of the cast-iron shoes, because we conceive that a wrought-iron shoe of a figure equally serviceable and beautiful, could not be made at a price sufficiently moderate; and as to their liability to break, we do not believe them to be so liable, when they have undergone a judicious, careful, annealing. It occurs to us, that persons might easily take the model of their horses' hoofs in plaister, and by having a casting made from it, they would by these means have the exactest fit possible. How often have we winced in sympathy for the poor horse, on seeing the *red-hot shoe* being fitted to his foot! Supposing that the horse suffers no pain by this mode of proceeding—must not the burning of the hoof tend to destroy or interrupt certain secretions which may be necessary to a healthful condition of the feet, and to introduce diseases of those parts? We know nothing ourselves of *farriery*; but reason tells us that such a system of treatment must be prejudicial to the horse, and consequently injurious to the owner. Our Readers will, however, judge for themselves. Our Engraving at the head of this article represents the under or ground side of the shoe. A A is a cord, or

raised border, the use of which is to strengthen the inner vein or web; also to prevent any piece of flint, gravel, &c. from being thrust or forced on the sole of the foot, which frequently happens with the common shoe, as that affords no such protection. This form also gives great security to the tread of the horse, either over pavement, road, or field, and consequently safety to the rider or driver. Owing to the concavities formed at the ends of the shoe, powerful stops are thereby made, as at B, which are fully equal, in effect, to the usual rough shoeing or turning up at the heels, without altering the even bearing of the horse's feet upon the ground—so essential to his true motions, and to the security of both horse and rider from falling.

The Inventor and Patentee (Mr. DUDLEY, of King-street, Soho) states, that as a hunting shoe has been proved, by experiment, to require from five to seven pounds less weight at every step to extricate a horse's foot out of a clay field, than if shod in the ordinary way; and that when travelling over snow, they are not so likely to ball under the feet.

Shoes may be made on the Patentee's plan, of any size, figure, or pattern, exactly suited to the feet of any particular horse; and supplied in any quantity all precisely alike.

ON ILLUMINATING THE PUBLIC CLOCKS.

"To the Editor of the Register of the Arts and Sciences, &c.

"SIR,

"In No. 7 of your interesting publication is a letter, containing an invitation to the clock-wardens of the metropolis to establish night clocks, for the benefit of its ever-circulating population. I must be allowed to second Mr. T. B.'s motion; and in the hope, that if a little more stir is made on the subject, it may seriously be taken into consideration, I will trouble you with these few lines. I confess it rather surprizes me, that in a country like our own, where every thing that conduces to comfort is so much studied, and where there is no lack of inventors and inventions, so useful a piece of mechanism should never have yet appeared in some public situation of our principal streets; whilst in a third rate town

of France there is a night-clock, which performs its duty with a most satisfactory regularity. As far as I understand the subject, I conceive the construction would be of the simplest kind. A dial-plate, out of which the figures shewing the hours are cut in contrary succession to the usual representation of them, is made to revolve on the axis that would otherwise receive the hour-hand. Behind it is a solid field, out of which a sufficient space is cut to shew, by means of a strong light inside, the hour, half, or quarter of an hour, which is passing in front. At the centre of the opening is, of course, to be seen the time being. Each half hour is represented by a star, each quarter by a dot, cut out of the dial between the hours. Thus, the passed hour, with the following quarter, half, or three quarters, may be seen at once, and as that hour sets on the right the succeeding hour rises on the left. A good gas light behind will answer every purpose, and there can be no objection to have it lighted by a candle, instead of a rod of granulated platinum. The clock should be made to go as many hours as the season requires ; and I take it for granted that there are places enough in London where some one, residing within or near the building, could give it, evening and morning, regular attention.

" I hope, Sir, we shall soon see something of this kind appear at the Royal Exchange, St. Paul's, Exeter 'Change, St. Martin's Church, or some such conspicuous building. Meanwhile, I trust you will not let the subject drop. I am, Sir,

" *Broad-street,* " Your most obedient,

" 5*th February,* 1824. " J.

In the above engravings which we have had executed to elucidate our correspondent J's. plan, we have taken the liberty of illuminating a larger portion of the dial plate than he proposes. If only the space of one hour were to be exhibited, it would not be easy to ascertain the time at certain periods : for instance, at VIII o'clock, there would only be seen half of the VIII and half of the VII, which would lead to mistakes, particularly as the hours would be to be reckoned the reverse way to that by which they are usually told.

We have, in our own opinion, a very superior plan on the subject, founded upon the idea given us by our ingenious correspondent, which we purpose submitting to our readers in the next number.

VAPOUR BATH.

Fitz-sweyn has forwarded us a replication to the objections of Veritas on the subject of his *Vapour Bath*; but from the great length of it (almost a Vapour Bath of itself)—from our horrible dread of controversial explanations, and from a press of other articles, we are obliged to endeavour to condense the matter to a lesser bulk.

He ridicules, and we think justly, the objection of Veritas, on the score of its moderate cost, and of its height—which might be easily reduced to the altitude of the bather. He states, that it can hardly be deemed cumbrous, as it weighs no more than five or six

pounds.—And as to the difficulty of the aged and infirm becoming participants in its luxuries, he fully explains it away, by proving that nothing can be more facile than the introduction of the patient. He then goes into more important considerations, and says, 'I, have not employed any means to control the column of vapour, for in the scores of times that I have bathed, I never found any occasion for it; nor do I believe it possible for a person to be scalded in the bath, unless he should try to stop the steam-pipe with his toe, in which case he must not blame me; but if the bath is found to be too hot, let the attendant cease blowing the fire, which will answer the purpose effectually.

Veritas informs us "that vapour rises;" that the head and trunk will thus become hotter than the feet;" which I have no doubt is the case, in a small degree, though I never experienced any inconvenience from it; and "that it will occasion a determination of blood, which *may* prove dangerous." To this I can only say, that it would be dangerous in the extreme, if the bath produced a determination of blood to the head particularly, as in apoplexy, but on the contrary, the determination is to the surface generally all over the body, which is precisely the effect to be wished.

THE WELCH CRADLE CHURN.

This Churn is of the simplest construction; it derives its name from its figure, being like a cradle, and from its being rocked in a similar manner. It may be worked with perfect ease by a child of five years old, which makes it a truly valuable acquisition to the cottager. We are disposed to think that rocking motion is favourable to expeditious churning, and when it is considered what a powerful agitation is given to the cream, at the most trifling expense of labour, it must be admitted to be a most admirable and useful invention. We imagine that the shape of the half of a cheese, or of a half moon, to be a suitable figure.

NEW TUNNEL UNDER THE THAMES.

A Meeting was, on Wednesday last, held at the City of London Tavern for the purpose of considering the plan proposed by M. I. Brunel, Esq. F. R. S. C. E. for "opening a road-way under the Thames, below London Bridge, near the east-end of the London Docks." Mr. Brunel, in his "Proposals," goes fully into the expediency of the measures, and instances from the success which has attended the connections formed of the opposite banks between the river, by means of the Blackfriars', Waterloo, and Vauxhall bridges, the reasonable probability which exists of profit to those who shall embark their money in such an undertaking. The estimated expense is so considerably under that of the erection of a bridge, as to have induced doubts as to its accuracy,—"but, to remove these" says Mr. B. "it is sufficient to state that it will be constructed almost entirely of brick,

which is the cheapest of all building materials, not merely as a material, but also in the labour; and though these are intended to be laid in the best Roman cement, in preference to ordinary mortar; the cost of a rod of brick thus laid will not exceed £18, exclusive of the labour; and, as the length of the body of the Tunnel will be 1200 feet, (a length, exceeding by much that of Westminster Bridge) it will require 1280 rods of brick, the amount of which, at £18 the rod, will be £23,040, a sum that would scarcely pay for a single pier of a substantial bridge: this will be sufficient to give some idea of the cheapness of a structure, which is composed entirely of brick."

He then gives what he conceives will be an accurate estimate of the expenses to be incurred for carrying the plan into execution, which he states at £160,000, and this sum he proposes to raise by transferable shares.

The public are already aware of the general nature of the Tunnel, and of the method to be employed in the formation of it, upon the subject of which, our limits and the time prevent us from at present entering. The plan, however, we conceive to be quite feasible, and its execution will, we doubt not, ensure a rich harvest to the promoters of it. Such a means of intercourse will elicit much curiosity, and in the minds of the weak some dread. "The declivity of the descent," says M. Brunel, "not exceeding four feet six inches in every hundred feet will be perfectly easy. In point of effect, we have nothing in the way of comparison to offer, that will give a just idea of the appearance that the entrance will present at first sight, but it will be perfectly novel, and rather imposing; and the day light will gradually blend with and subside into the artificial light, so that no inconvenience will be experienced from the transition."

The Meeting was most respectably attended, and a great number of scientific gentlemen were present, who expressed their fullest conviction as to the practicability of the plan, and of the advantages that would be derivable from it. Several resolutions were unanimously passed; and a committee of thirteen, with power to increase their number to twenty-one, was appointed to enter into the necessary arrangements with M. Brunel, for carrying them into effect, and upwards of one fourth of the sum proposed to be invested was subscribed in the room.

MISCELLANEOUS ARTICLES.

ANOTHER THEORY OF THE SUN.—A "sage philosopher," one of the Trans-Atlantic school, has, we understand, lately propounded a doctrine as novel (so far as our own poor knowledge goes), as it is luminous. He proves *incontestibly* that the centre of one system is a sphere of pure PHOSPHORUS, which constantly evolving *phosphuretted hydrogen*, exhales its brightness to lighten this department of the universe. He will not commit himself by pronouncing it to be uninhabited, but thinks it not unlikely that the alliaceous odour which must necessarily be emitted, would be infinitely too powerful to sustain animal life!

On the Cause of regular Figures formed by Hoar-Frost on Windows.—This curious phenomenon was ascribed by M. Mairan to the pre-existence in the glass of certain regular figures and lines generated during its formation, and he supposes that the particles of Hoar-Frost deposit themselves according to these figures. M. Carena in a Memoir *Sur le Givre figurée,* published in the *Mémoires de Turin,* for 1813 and 1814, p. 56—79, has overturned this hypothesis, and shews that the following are among the principal causes of the phenomenon.

1. The natural force of crystallization.
2. The necessity of the Hoar-Frost extending itself along a plane surface, which restrains the *quaquaversus* tendency of crystallization.
3. The numerous and varied resistances presented by the surface of the glass.
4. The imperfect and irregular conducting power of the glass, which is apt to produce in the vapours curvilineal motions at the instant preceding their congelation. M. Carena placed a small copper disc on the outside of one of the panes of glass, and found that the corresponding part of the glass was always free from the Hoar-Frost. *Ed: Phil: Jour.*

Tea.—Soon after the introduction of Tea into England, an act of parliament was passed (1660), by which a duty of eight-pence was laid on every gallon of the infusion sold in the coffee houses. In 1666 it was sold in London for sixty shillings per pound, which cost at Batavia from 2s. 6d. to 3s. 6d. per lb. It continued at this exorbitant price till 1707. In 1715, green Tea began to be used; great quantities were imported, and the practice of drinking Tea became general. Since that time the demand for Tea has been annually increasing. The quantity of Tea imported annually into Great Britain and Ireland, from 1717 to the beginning of the French Revolution, is as follows :—

From	1717	to	1720	700,000 lbs.
	1732	to	1742	1,200,000
	1755	—	—	4,000,000
	1766	—	—	6,000,000
	1785	—	—	12,000,000
	1794	—	from 16 to	20,000,000

Since 1794 the importation has considerably increased.

Animalculæ.—Leeuwenhoeek says, that a thousand millions of animalcules are discoverable in common water, which are not altogether so big as a grain of sand! Now, as every animalcule is an organised body, how delicate and subtle must the parts be that are necessary to constitute it, and to preserve its vital actions! How infinitely beyond the utmost effort of imagination, to conceive in the narrow compass of one of these animalcules, the existence of a heart as the fountain of life—muscles necessary to its motions, glands for the secretion of its fluids, stomach and bowels to digest its food, and other innumerable members!

Variety in the Colours of Flowers.—By sowing in the same bed, the seeds of red, blue, or yellow flowers, all the intermediate tints may be produced, of orange, purple, &c., and many of the single flowers of varied colours. The variegations are the more singular and pleasing in proportion as the colours of the flowers from which the seeds were obtained are strongly contrasted.—The seeds from a white and a yellow ranunculus, which are planted in the same pot, will produce sulphur-coloured flowers. In the same manner may be obtained, from red and yellow ranunculuses, Aurora-coloured flowers.—It may be easily proved that this phenomenon arises merely from the influence of the farina; because, when the flowers are planted separately and at a distance from each other, they produce only the same colours.

To obtain Double Flowers.—Transplant them several times the first year, as in spring and autumn, without suffering them to flower. By following this method for two years successively, single carnations may frequently be converted into double ones.

Different coloured Flowers on the same Stem may be artificially obtained, in the following way:—Scoop out the pith from a small twig of alder, and having split it lengthwise, fill each of the parts with seeds of flowers of different colours, that germinate about the same period; surround them with earth, and then tying the two pieces of wood together, plant the whole in a pot of earth properly prepared. The stems of the different flowers will be so incorporated as to appear to the eye but as one stem, and will throw out branches covered with flowers of the various kinds sown.

Protecting Plants from Insects.—It has lately been discovered that the washing plants, with a solution of bitter aloes, will completely preserve them from the pernicious effects of insects, and it has this peculiar advantage over alkaline and other solutions hitherto used for the same purpose, that it does not in the least degree injure the plants.

Economy in burning Coals.—The Welch people have a method of preparing their coal for the hearth, by which the quantity of fuel is doubly increased, and the duration of the fire is said to be thrice as long as when coal alone is used. To every bushel of the smallest coal, the smaller the better, they add a bushel of soft clay or river mud; these are intimately mixed together, and formed into balls about the size of an orange, which are dried and rendered fit for use in a few hours. The heat from a fire made with these balls is regular, ardent, and intense. If made with clay and coal, it lasts 18 hours; but with mud and coal, only about 12 hours. By this method of preparation it is calculated that a bushel of coal will go as far as four consumed in the usual way.

Method of smoothing the Edge of Razors.—M. Merimée in a paper contained in the *Bulletin de la Société d'Encouragement*, recommends a crystallised tritoxyd of iron, called by the French mineralogists, *fer olgiste spéculaire*, (specular iron ore,) as infinitely

preferable to the powders hitherto employed, such as coleothar, fine emery, black lead, &c.

Curing of Fish and Bacon.—We understand that the following simple and easy mode of preserving mackarel, pilchards, horrings, and sprats, has been proved by several years experience to answer extremely well. Procure some water-tight casks or vats, and half fill them with a brine made from about 28 parts of solid salt to 72 parts of fresh water. Into this brine, the fish, gutted or not, are to be thrown as fresh as possible, sufficient to nearly fill the cask. As some moisture will exude from the fish during the pickling, it is better to add more salt to saturate it; and as the brine is always weakest in the upper part, a piece of basket work, or lattice work frame, should be provided, to fit inside of the cask or vat, and sunk an inch or two below the surface of the brine, upon which is to be placed some large lumps of solid salt, which will keep fully saturated the whole of the liquor, and keep it so as long as the lumps remain undissolved. The solidity of these lumps admit of their being applied several times, or as often as the vessels are replenished with fish. The fish are to remain thus immmersed in the liquor for five or six days, when they may be taken and packed in large grained salt, as usual.

Various sorts of provisions are best preserved by this process, particularly bacon, which is not so liable to become rancid.

Bad Qualities of Paper.—In order to increase the weight of printing paper, some manufacturers are in the habit of mixing sulphate of lime, or gypsum with the rags to a great extent. I have been informed, by an authority upon which I place great reliance, that some paper contains more than one-fourth of its weight of gypsum; and I lately examined a sample, which had the appearance of good paper, that contained about 12 per cent.

The mode of detecting this fraud is exceedingly simple: burn 100 grains, or any given weight of the paper, in a platina or earthen crucible, and continue the heat until the residium becomes white, which it will readily do, if the paper is mixed with gypsum. It is certainly true that all paper contains a small quantity of incombustible matter, derived from accidental impurities, but it does not amount to more than about one per cent.; the weight, then, will indicate the extent of the fraud."—Brande.

The professor just quoted also mentions a circumstance of a Birmingham button-maker, who had a large quantity of newly-made buttons, so much tarnished as to be unsaleable; and upon examining into the cause, it was found to be owing to their being left in the paper in which the buttons were wrapped up, a considerable quantity of chlorine, or oxymuriatic acid, which is used in the bleaching. There are very few goods that would not be injured by the action of chlorine.—A coloured paper manufacturer would find it difficult to fix any vegetable colour upon paper so impregnated—and the loss to him might be very serious. Great caution is therefore necessary in the purchasing of paper for such purposes.

To recover Beer when Sour.—Add some oyster shells calcined to whiteness, a little salt of tartar, or some powdered chalk. Either of these will correct the acidity, and make it brisk and sparkling. It should be drank almost immediately.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

GUNPOWDER MILLS.—To the person who shall invent and discover to the Society the most effectual mode of preventing explosions in gunpowder mills. The Gold Medal, or One Hundred Guineas.

FAMILY PORTABLE MILL.—To the person who shall invent and produce to the Society, a mill for grinding corn for the use of private families, or parish poor; the construction to be simple, the mill to be easily worked, and superior to any hitherto in use. The Gold Medal, or Fifty Guineas.

MACHINE FOR RAISING COALS, ORE, &c. &c.—To the person who shall invent and produce to the Society a machine for raising coals, ore, &c. from mines, superior to any hitherto known, or in use, and which shall produce the effect at less expense. The Gold Medal, or Fifty Guineas.

RECENT PATENTS.

To JOHN VALANCE, of Brighton, Sussex, for his invention of an improved method of artificially freezing water. Sealed 1st January, 1824.

To JOSEPH FOOT, of Charles Street, Spitalfields, Middlesex, silk manufacturer, for his invention of an improved umbrella. Sealed 15th January, 1824.

To FRANCIS DEVEREUX, of Cheapside, London, for his invention of certain improvements on the mill or machine for grinding wheat and other articles, commonly known by the name of the French military mill. Sealed 8th January, 1824.

To JOHN WHITE, of New Road, Mary-le-bone, Middlesex, architect, for a new invented floating breakwater. Sealed 15th January, 1824.

To JAMES RUSSELL, of Wednesbury, Staffordshire, for his invention of an improvement in the manufacture of tubes for gas, and other purposes. Sealed 19th January, 1824.

TO OUR READERS AND CORRESPONDENTS.

We have received many letters of enquiry upon different subjects, to each of which, if possible, we would be sincerely glad to afford a satisfactory answer; but the points are so multifarious—are in most cases so well known to general readers—and would occupy so much space, that we are compelled to refrain. We hope this will be taken by our friends in the spirit with which we desire to convey it, and that they will not think it proceeds from any contemptuous or improper feeling.

We have before us the letter of "A constant Reader," on the subject of James Cross, and should be glad to receive from him any observations which he may have made at the time of the application he speaks of;—would it be decorous in us to hint at a copy of the reasonings he offered.

I. B. B. complains that he cannot keep our numbers smooth enough for ultimate binding:—if I. B. B. will just pass over them while damp a moderately heated iron he will make no more complaints.

We beseech L. A. to allay his apprehensions.

"A Constant Reader" is informed that he must address his communication to *Arthur Aiken, Esq. Secretary, Society of Arts, Adelphi, London.*

[*To be continued every* Fortnight.]

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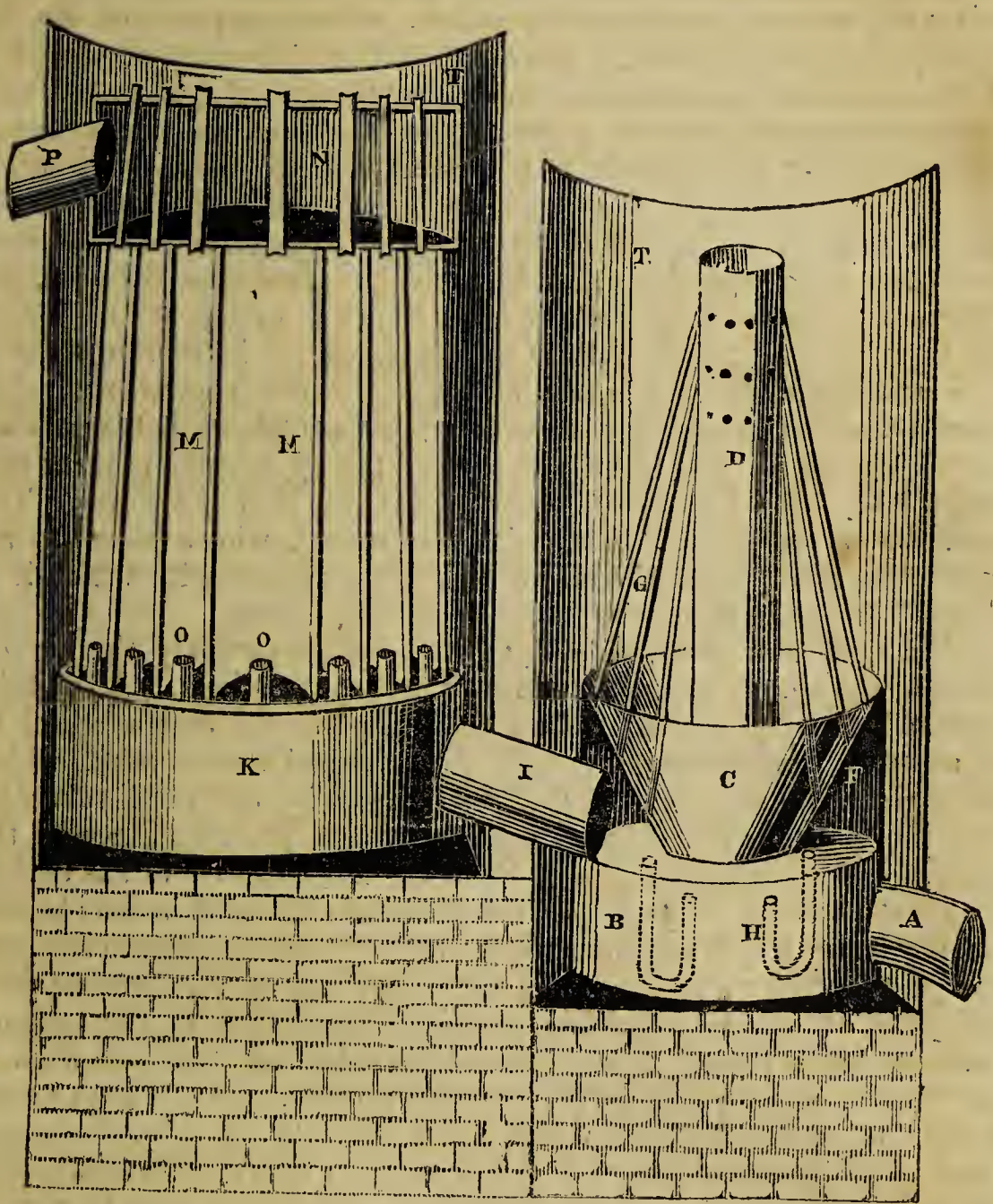
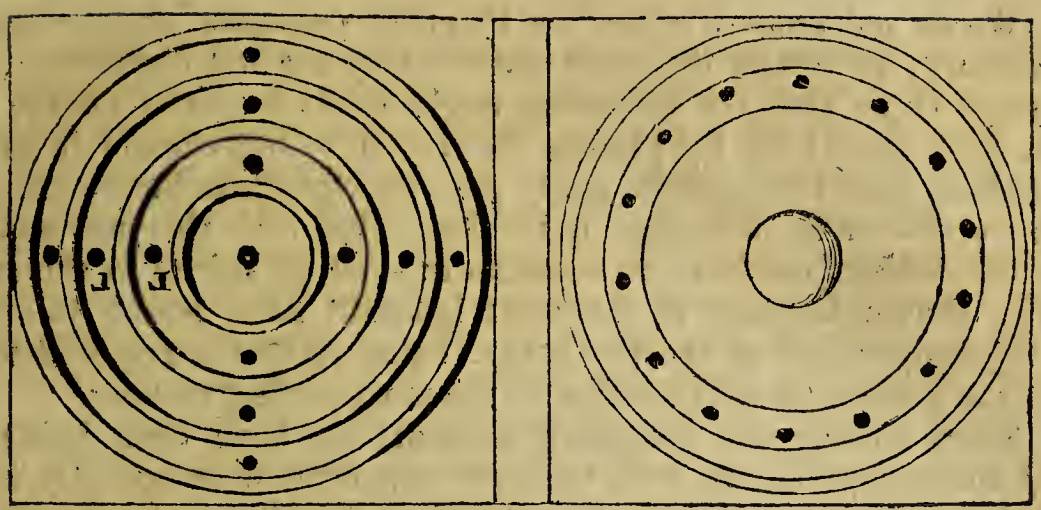


WINTER'S PATENT DISTILLING APPARATUS.

In the construction of this important apparatus, the inventor has exhibited not only great ingenuity, but likewise an extensive and scientific knowledge of the subject he had to operate upon. Its principle is founded upon the well-known fact, that the mixed vapours of water and spirit are not condensable at the same degrees of temperature; water requiring a heat of more than 212° Fah. to be kept in

a state of vapour, while spirits of intense strength will evaporate at a heat very little above the common temperature of the atmosphere. The office of the apparatus, is, therefore, to condense the aqueous portion of the mixed vapour from the still before it passes into the worm. It is applicable by its construction to Stills of every form, and enables the distiller, by the addition of it, to extract and condense the whole of the spirit contained in the wash, at a single operation, instead of the repeated distillations as usual, without the apparatus. The vapours from the Still are first made to enter into a receiver of a very peculiar construction, whose temperature (by the agency of a water bath that surrounds it) is uniformly preserved at 170°, or thereabout, depending upon the strength of spirit required: in this receiver the aqueous particles, or those that require a heat of more than 170° to be kept in a state of vapour, are condensed; while the spirituous vapours from their superior volatility pass into the second receiver. This second receiver is also of a peculiar construction, and, being kept at a lower temperature than the first, (at 140° or less) the whole of the weaker vapour, or that which is condensable at from 140° to 170° of temperature, is therein reduced into a liquid state: while the strong spirituous vapour ascending alone through certain very narrow spaces contained between concentric cylinders, into the upper part of the apparatus, is there collected into a third receiver, prior to passing into the worm. The worm is surrounded as usual with cold water, whose powerful refrigerating effect upon the strong spirituous vapour with which it is charged causes it rapidly to pass into the fluid state.

We shall now proceed to describe more particularly the several parts of the apparatus, with reference to the engravings. A is a tube by which the vapours enter from the Still into the first receiver B. C, a conical surface or plate. D, the principal vapour tube, which being closed at the top, the vapours descend by the small tubes G, into the chamber F. These small tubes are placed all round the principal tube, which are inserted in the holes shewn in the engraving just above D. The apparatus is surrounded with water, heated to about 170°, and is contained in the tub or bath T, shewn in section; and as the vaponrs contained in the tubes are by this arrangement separated into small portions, a rapid condensation of the aqueous particles takes place. A number of bent tubes, as at H, are fixed in the annular plate which covers the receiver B, with their upper ends a little above the surface, which serve to carry off the condensed liquid back into the receiver B. The vapour, improved in its spirituosity, is then collected in the chamber F, and passes from thence by the tube I, into the second receiver K. The top plate of this second receiver K, as well as the bottom plate of the third receiver N, have a number of openings or apertures forming concentric circles, as at J J in the ground plan of the apparatus, which we here annex.



Into each of these annular apertures ɹ ɹ, are fixed *two* copper cylinders, one within the other, and only about a quarter of an inch apart; and as there are four such apertures, there are consequently eight cylinders or four pairs in the apparatus, which are exhibited in section in the first engraving at M M. O O are tubes which pass through the receiver K, to convey water between the cylinders; similar tubes are passed through the receiver N, by which means the water is diffused over every part of the extended surface of the apparatus, effecting thereby almost as rapid a condensation of the aqueous portion of the vapour, as if the water were in actual contact with it. The vapours passing from the lower receiver K, ascend, as before mentioned, through the narrow spaces between the cylinders, into the upper receiver N, in a high state of purity and strength; from this last hold it proceeds into the worm by the tube P, where it is instantly condensed by the refrigerating effect of the cold water, with which this part of a distillatory apparatus is always surrounded.

It is, perhaps, not unnecessary to repeat that the water contained in the second bath T, shewn in section, is heated to 140° (or less, as the spirit may be required) that being a degree of temperature at which the vapour of water, as well as those from the empyreumatic oils, cannot exist. The spirit is thus separated effectually, and without any difficulty from the least taint of empyreuma, with which British spirits are in general more or less contaminated.

The important advantages that must result from the employment of Mr. Winter's Apparatus must be obvious to every body acquainted with the subject of distillation. The introduction of it into a distillery, requiring no displacement of the ordinary utensils, will materially tend to a very general adoption of it by the distillers. The cost of the apparatus, although a consideration of an immediate nature, strictly accords with true economy; as the increased profits that must be acquired by the new process will soon reimburse the distiller in the expense: and we think the distiller would do well to calculate how much *fuel, time,* and *labour,* are lost by the old process? The extra expense of unnecessarily extensive premises, the cost and wear of a great variety of utensils—the great waste of water—and the loss of spirit by evaporation in the air, would be also calculations worthy of his attention.

We do not know whether the Patentee proposes, or considers it necessary, to rectify the spirit obtained by the first distillation.—It appears to us that the flavouring might easily be given (in the first and only operation) by placing the requisite ingredients in such a situation, that the vapours might pass through them before entering the worm.—It is, however, quite clear, that with this new apparatus the distiller can have no occasion to send his spirits to the rectifiers : the employment of the most ignorant man, merely to attend to the temperature of the two baths, being all that is required to effect the process of rectification in the most perfect manner.

Since writing the foregoing account, we have been informed, that some experiments with the new apparatus were recently instituted under the inspection of experienced distillers, at an eminent distillery in London, the results of which are in perfect accordance with our statement made in the beginning of this article. "*Faints**," 80 *per cent. under proof were put into the still, and came out, at one operation* 55 *per cent. over proof!* The employment of an apparatus that will do this, must indeed be a valuable acquisition to the distillers of rum in the West Indies, for, besides the advantages already mentioned, as accruing to distillers in general, our colonial distillers would be able to pack their rums in half the usual bulk, owing to their increased strength, and thus save half the number of puncheons and half the cost of the freight.

We sincerely congratulate the inventor, Mr. Winter, (who, we understand, is an eminent distiller in France,) not merely on account of the excellence of the invention, and on the probability of its extensive adoption ; but, in having chosen such men as Messrs. W. Pontifex, Sons, and Co. to manufacture the apparatus, who, uniting to their practical knowledge an intimate acquaintance with the philosophical principles, upon which the structure of the various machines and utensils they manufacture are founded, are consequently able to overcome any difficulty that might arise in perfecting the ideas of the projector : and of introducing those little, yet important, improvements in the construction of the parts, which are frequently overlooked by the inexperienced. We make this remark, because we have known instances wherein the success of several ingenious and useful inventions have been marred, or lost to the inventors, by the employment of persons incompetent to carry the plan of the projectors into effect, by their want of talent and information.

ON DISTILLATION.

(Continued from page 148 *in the last Number.)*

Rum is distilled from molasses, or treacle. The spirit is purer than that obtained from malt, being less contaminated with those essential oils which communicate an unpleasant flavour to malt spirit, when not very carefully distilled and rectified.

* "Faints" are the refuse of the distillery; they are the remains of the wash left in the still, after having undergone three distillations in the common way; they are almost destitute of spirit, and are nauseous in the extreme.

In this country it is made from common treacle, dissolved in water in the proportion of about a pound to the gallon, and fermented in the usual way. In distilling off the spirit it is said some particular art is necessary, otherwise it will not prove so vinous as malt spirit, though much cleaner tasted. The chief use of this spirit is *to produce an imitation of French Brandy*, which it is made to approach very nearly, by fermenting with the molasses a quantity of fresh wine-lees, abounding in tartar, which communicates to it such a great degree of vinosity and briskness, as to make it pass with ordinary judges as French Brandy. Great quantities of this spirit are also used in adulterating the more expensive foreign spirits; as well as in making cherry brandy, and other cordials, by infusion. Molasses spirit, like all other spirits, is entirely colourless when first extracted, but distillers always give it the colour of foreign spirits.

In the West Indies, Rum, properly so called, is made from a variety of materials, which are all, nevertheless, the produce of the sugar cane; and it seems to be a general opinion, that the flavour and fragrance of Rum is derived from the cane itself, which contains a peculiar essential oil. In making sugar, the expressed juice of the cane receives several successive boilings, to separate the grosser matter, previous to its being crystallized. During this operation a considerable quantity of scum rises to the surface, which is carefully taken off by the skimmer, and reserved for the making of Rum. In a subsequent operation, the sugar, in the form of a thick syrup, is poured into casks or hogsheads, standing upright upon a strong framing over a large cistern: the casks are perforated in their bottoms with a number of holes, which are stopped with pieces of sugar cane. A portion of the syrup drains through the spongy substance of the cane, and is received into the cistern beneath, which is called melasses, or molasses. The molasses so obtained is different both in flavour and consistency, to that usually sold in London under the name of treacle, which is obtained by the refiners in the making of lump sugar. The West India treacle, (which the writer of this has often tasted) has a Rum-like flavour and taste, is more spirituous, oily, and fluid, than the London treacle, which will account in some degree for the difference in the spirits obtained from them.

The raw juice of the sugar cane,—parts of the cane itself—the skimmings from the sugar boilers—and the molasses, form the principal ingredients in the distillation of genuine Rum. These ingredients vary in their proportions according to the season, the convenience, and the stock of the distiller. The processes of fermentation and distillation are conducted in the same manner as in England.

It is customary in most of the West India islands to put some sliced pine apples in those puncheons designed for presents to European friends, which produces the agreeably flavoured spirit called pine-apple Rum.

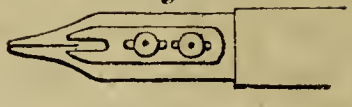
[*Having extended this article on Rum, to a greater length than we intended at the outset, we are compelled to postpone the continuation of the subject, on Brandy and Alcohol, till our next number.*]

OX-POWER COTTON MILLS.

A Cotton-spinning mill, on the English plan, is erected at St. Gall, in Switzerland, which is moved by the power of an ox, walking in a large wheel. The diameter of the wheel is thirty-five feet; and on the inside of the periphery of the wheel are fixed pieces of wood, as usual in walking wheels, for the animal to pace upon as it turns round. Three oxen work successively for two hours at a time, making four hours to each of the oxen. This power works two hundred and nineteen frames, each containing two hundred and sixteen bobbins and spindles. One hundred and thirty persons are employed in the manufactory, one half of whom are children, who earn about 3½d. sterling each per day; the men's earnings are about 2s. 1d. per day, which is only half what they received a few years ago.

Fig.1.

Fig.2.



HAWKINS AND MORDANT'S PATENT PORT CRAYONS AND PENS.

Mr. J. Hawkins, of Pentonville, engineer, and Mr. S. Mordant, of the City Road, Portable Pen-maker, having taken out a patent for their little elegant inventions as above described, we are happy in having it in our power to present our readers with a drawing and description of them.

The first of these inventions is a Pencil-case, which has an internal slider actuated by a screw, for the purpose of projecting forward the black lead as it wears away (which is done simply by holding the nozle of the pencil-case between the fore-finger and thumb of one hand, and turning round the pencil-case with the other) without the necessity of cutting. Crayons and chalk are of course applicable to the same contrivance.

Fig. 1 is a section of the Pencil-case. A is the black lead, or crayon, encompassed by that portion of the case called the nozzle, which, with the whole of the case is made of metal. B is the driver, being a hollow cylinder, with a screw thread round a part of it; at the end of this screw the black lead is inserted and held fast. C is the elongated part of the driver, which passes through the guide, D. At E, within the outer case, is another cylindrical piece, connected to the nozle at one end, and having at the other a hollow screw, that works round on the thread of the driver, B, and as it turns, causes

the projector to advance or recede, as may be required. The outer case may be made of gold, silver, ivory, tortoiseshell, &c.

With respect to the making of pens, the patentees propose to make them of tortoise-shell, or horn, instead of quill; and when the material is cut into nibs to soften the part in boiling water, and then impress into them small pieces of diamond, ruby, or other hard substance, by which means, pens of very great durability with a pleasant elasticity may be made. To give stability to the nibs, the patentees further propose to affix to the tortoise-shell, or horn, thin pieces of gold or other metal, and attaching the same by the before mentioned means, or by any other convenient means, such as cement or varnish. It is likewise suggested that springs may be placed on the back of pens, as shewn at *Fig.* 2, which may be slidden backward or forward, and thus vary the elasticity according to the different hands that may be required in writing.

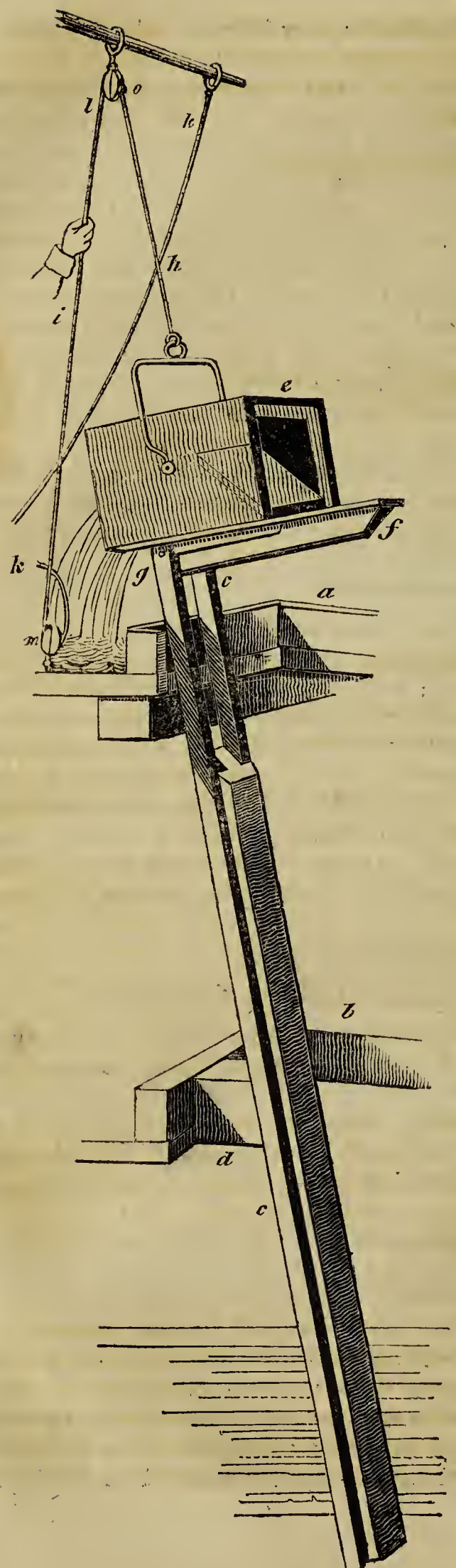
We have been informed by a gentleman who writes a great deal daily, that he has had one of the pens just described (with ruby points for the nib) in constant use for nearly eight months, and that it is now quite as good as ever.

Mr. Marshall's improved Melting Pots are made of a mixture of Stourbridge clay, potsherds, and pulverized coke, well incorporated together by beating; and instead of being *thrown* on the potter's wheel, the pot is made by pressing the above composition into a brass mould of a proper size and figure, by means of a core worked by a powerful screw press. The vessel thus acquires a great and equal degree of solidity throughout, while the intermixture of the coke with the clay, by giving a certain porosity of texture, renders it much less liable to crack, on transition from heat to cold, than those Melting Pots composed entirely of earthy ingredients. *Trans. Society of Arts.*

MACHINE FOR THE BALING OF SHIPS.

An apparatus of great simplicity of construction, and facility of application, for the Baling of Ships, has recently been invented by Mr. James Dennett, of Newport, in the Isle of Wight. A model of the apparatus has been forwarded by him to the Society of Arts, of which the annexed engraving is a just representation. For this very useful invention, the Society presented Mr. Dennett with their large Silver Medal.

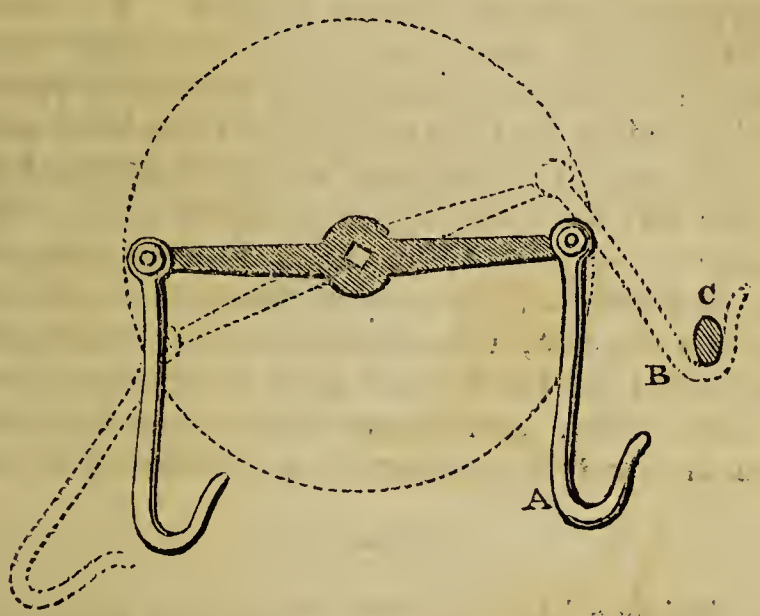
A consideration of the deplorable and extensive loss of human lives, occasioned by ships springing a leak at sea, led Mr. Dennett to the construction of his apparatus, which will no doubt be found a powerful auxiliary to a ship's pumps in cases of danger. It not unfrequently happens on these calamitous occurrences, that the pumps from being worn, or from some accident, are rendered useless; and the usual method resorted to of baling the water with canvass buckets through the several hatchways, are often ineffectual, after the most painful and long-continued exertions to save the ship from sinking.



Description of the Engraving.

A and B are parts of the hatchways of the upper and lower decks. C C is a long rebated slide, in an inclined position, reaching from a little above the coamings of the upper deck to the ballast in the hold, and attached to the lower hatchway by a block, D. E is a square bucket, made to slide on the rebate of C C; its bottom is a flap valve, so that when it slides down into the water it opens, the bucket fills instantly, and closes upon being drawn up full of water, without any attention on the part of the workmen. The upper portion F, of the rebate of the long slide is made detached, and is fixed in its place by the pin G, on which it turns as on an axis. The bucket is shewn discharging the water on the upper deck, and when the rope H I K is let go, the bucket falls down, rights itself, and the upper portion F, of the slide, falling down with it and joining the lower part; the bucket runs down the whole of the slide into the water, is instantly filled, aud drawn up again by pulling the parts I K of the rope, the part K having passed through a block, M, on the deck. A pin is fixed in the top of the rebate, so that when the bucket rises up, and is only in the loose portion F, it is stopped by the pin, and the loose portion F, by farther pulling, rises out of its place and upsets the bucket. To prevent the bucket from being pulled higher up than is requisite to discharge the water, a knot is worked in

the rope, which forms a stop against the block L. The block L is made fast to a yard arm, and the upper end of the rope K is secured to the same, or elsewhere, with just length enough to let the bucket reach to the bottom of the slide.



MR. SPEER'S CENTRIFUGAL CHECK HOOKS.

This very simple, yet no less useful contrivance forms part of an apparatus for the prevention of accidents in raising men or minerals out of mines, by the ropes "running wild," (as it is termed) and for which the inventor, Edward Speer, Esq. of New Inn, was presented with the Silver Vulcan Medal by the Society of Arts.

A bar is fixed on the end of an axis. Two hooks as A, swing freely on the ends of this bar. C is a short bar or stop projecting from the frame of the machine for the hook to catch hold of. When the bar revolves at a moderate rate, the hooks constantly hang down by their own weight, and keep clear of the stop C, but when it revolves with a dangerous rapidity, the centrifugal force cause the hooks to diverge from their pendant position, and one of them catches hold of the check bar C, (as shewn by the dotted lines) which stops the machine instantly.

The centrifugal check-hooks, might be rendered applicable to cranes and other machinery, and we think it would be a decided improvement to give some degree of elasticity to the check-bar (which might be done in various ways) to lessen the force of the shock occasioned by the sudden stopping.

Plaister Casts of Leaves and Flowers.—The following is the process recommended by the ingenious Mr. Deeble, the engraver, at Islington, by which that gentleman succeeds in taking the most accurate and beautiful casts from the leaves and other parts of plants.

The leaf, as early as convenient after being gathered, is to be laid on fine grained moist sand, in a perfectly natural position, with that

surface uppermost which is to form the cast, and being banked up by sand, in order that it may be perfectly supported. It is then, by means of a broad camel-hair brush, to be covered over with a thin coating of wax and Burgundy pitch, rendered fluid by heat. The leaf is now to be removed from the sand, and dipped in cold water, the wax becomes hard, and likewise sufficiently tough to allow the leaf to be ripped off without altering its form. This being done, the wax mould is placed in moist sand, and banked up as the leaf itself was previously; it is then covered with plaister of Paris, made thin, due care being taken that the plaister be nicely pressed into all the interstices of the mould by means of a camel-hair brush. As soon as the plaister has set, the warmth thus produced softens the wax, which in consequence of the moisture of the plaister is prevented from adhering to it, and with a little dexterity it may be rolled up, parting completely from the cast, without injuring it in the least.

Casts obtained in the manner thus described are very perfect, possess a high relief, and form excellent models, either for the draughtsman or for the moulder of architectural ornaments.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"SHOULD you think the following remarks worthy a place in your Register, they are very much at your service.

"ON THE SINGULAR PROPERTIES OF CARBON OR CHARCOAL.—A piece of meat, slightly tainted, may be perfectly recovered by first rubbing it with charcoal powder, and then boiling it in water with some small pieces of charcoal:—the meat may then be eaten, and no unpleasant flavour will he observed.

"RANCID OIL may also be rendered perfectly sweet by means of such a simple substance as charcoal.

"COFFINS may be preserved for an incalculable length of time if they are slightly charred on the inside and outside.

"Take a little stagnant water, and put it into a tea kettle with some pieces of charcoal and boil it, it will then be found to possess all the properties of beautiful spring water.

"Now if charcoal *does* really possess these singular properties, might it not be employed (or at least the carbonic acid gas) in cases of Putrefaction, Gangrene, Putrid Fevers, &c.?—no doubt it might: however, I shall leave it to some other of your readers to bring before the public such plans for the application of it, &c. as would be most likely to be attended with success; and I have no doubt myself, but that if physicians and surgeons would more generally resort to Pneumatic Chemistry, and apply remedies more simple than *cutting*, that more beneficial consequences would be the result.

"JUVENIS."

[When Charcoal is employed for the useful purposes mentioned by Juvenis, it should be used freshly made, or be put into close vessels immediately after it has been prepared, to be used as occasion

may require. We believe that Charcoal has been employed medicinally, as an anteseptic, for some years past, and in the particular cases mentioned by our correspondent.] Ed.

MISCELLANEOUS.

Iron Bridge of Suspension over the Thames.—We are informed that an application is about to be made to Parliament, for leave to erect a patent wrought-iron Bridge of Suspension over the Thames, from St. Catherine's to the opposite shore; the Bridge to be of an elevation sufficient to admit ships to pass under it at all times.

Raising Water from Deep Wells.—A Mr. Peechy, of Bury, has invented, it is said, a very simple apparatus, by which he can raise water from a depth of more than ninety feet, through an inch pipe. Mr. Peechy intends submitting his machine to the Society of Arts. The description of it is not yet made public.

The Componium, or Musical Improvisator.—A musical instrument called by these names has been lately exhibited at Paris. It is a kind of barrel organ, and what is very extraordinary, it is said, that it not only performs the pieces of music marked upon it, but that it "improvises." A theme being written on the barrel, the Componium plays it over, to render it familiar to the auditor, and then being left to itself, it executes an infinity of variations on the same theme, without any external impulse whatever; and if the variations are ever so complicated, they are always in unison with the rules of composition.

Chronometry.—Mr. H. G. Dyar, of Vermont, in America, has invented a clock, the principles and movements of which entirely differ from those Chronometers at present in use. The pendulum moves in a cycloidal arch, and performs long and short vibrations in equal times; while the pendulum of the common clock swings in the arc of a circle, making unequal vibrations in unequal times. In other respects its construction is very peculiar: the hammer which is balanced and turns on a pivot, strikes the internal limb of the bell; and the machinery of the whole is surprisingly simple, but two wheels being required to continue the operation of eight days, without renewing the power: three wheels will do this for a year, and four, we are told, will perpetuate the motion for a century. Two clocks upon the above construction are now in operation, which may be seen at a manufactory in Boston.

To Whiten Discoloured Pearls.—Soak them in hot water, in which some bran with a little tartar and alum have been boiled; rub them gently between the hands, which may be continued until the water grows cold, or until the object is effected, when they may be rinced in lukewarm water, and laid on writing paper in a *dark* place to cool.

Hydrogen Gas, enters largely into all vegetable, animal, and mineral compositions. Hence, by fermentation and decomposition in bogs and marshes, it is frequently set at liberty, and ignited by electricity, or some other accidental cause. This phenomenon, vulgarly called, "Will of the wisp," or "Jack with the lantern," has been observed in most parts of the world. In Persia, it is said, that the priesthood convert it into a *pious fraud;* by means of hollowed reeds, they conduct the carburetted hydrogen gas into one of their temples, which has been purposely erected upon ground abounding in bitumen, naptha, and other inflammable substances. The imposition is a very happy one, as the Persians have always been worshippers of fire, and they are thus constantly feasted with a view of their Deity.

Hydrogen Gas.—Mr. Cooper has ascertained that if *hydrogen gas* be breathed for a few moments it has the curious effect of changing the voice. The effect is observed on the person speaking immediately after leaving the vessel of hydrogen; but it soon goes off.

Gold Lacquer for Brass-work.—Put an ounce of turmeric powder, two drams of anatto, and two drams of saffron into a pint of alcohol; agitate it occasionally during a week, and then filter it into a clean bottle. Three ounces of clean seed-lac are then to be added, and the bottle shook up occasionally during a fortnight. The mixture will now be a fine Lacquer for Brass---which will give that metal the appearance of burnished gold. In using it, the metal should be just warmed, and the varnish be laid on evenly with a brush, passing it directly across the work.---Small articles may be dipped in the Lacquer.

Prevention of Rust.—The prevention of rust on such articles of furniture as are made of polished steel is an object of great importance in domestic economy. The cutlers in Sheffield when they have given knife or razor blades the requisite degree of polish, rub them with powdered quick lime, in order to prevent them from tarnishing; and we have been informed that articles made of polished steel are dipped in lime water by the manufacturer before they are sent into the retail market. *Ed. Phil. Jour. vol.* 5.

Effects of cold upon Ice.—On Lake Champlain, and other American lakes, and even on narrow rivers, fissures, and rents of enormous magnitude are often made in the ice, and are always accompanied with loud reports like those of cannon. The unwary traveller, who with his sleighs and horses adventures by night and sometimes even by day across the great northern lakes, is frequently swallowed up in the openings which are thus unexpectedly made in the ice. When the weather becomes warm again, before the ice melts, the fissures close, and sometimes the edges of them even overlap. At Plattsburg, in the winter of 1819-20, when the thermometer during night was from 15° to 17° below 0° of Fahr: and during the day from 10° to 12° below it, the reports of the rending ice were like those of a six-pounder, and the openings were from 10 to 15 feet wide. *Id.*

To make Leather Water-tight.—The New England fishermen preserve their boots water-tight by the following method, which it is said, has been in use among them above a century:—A pint of boiled linseed oil, half-a-pound of mutton suet, six ounces of clean bees wax, four ounces of rosin, well mixed over a fire. Of this, while warm, (not so hot as to burn the leather) with a brush lay plentifully on new boots or shoes, when they are quite dry and clean the leather is left pliant. Fishermen stand in water, with boots thus prepared, hour after hour without inconvenience.

Salubrity of the London Air.—It has been stated, that the happy exemption which the inhabitants of London for the most part enjoy, from the diseases common to other capitals, is owing to the sulphureous naphtha emitted from the coal serving the salutary purpose of checking the progress of febrile infection. To prove that the air is saturated with this naphtha, we shall not be able to recognise the presence of a wasp, an insect to which sulphur is obnoxious within the sphere of its action.

Indian Ink.—The Indian Ink is used in China for writing with a brush, and for painting upon the soft Chinese paper. It has been ascertained, both from experiment and information, that the cakes of this Ink are composed of lamp black and size, with the addition of some perfuming substances, not essential to it as an Ink. The fine soot obtained by holding a plate over the flame of a candle or lamp, and mixed up with clean size, makes an Ink in every respect equal to the Chinese.

Preservation of Fruit.—In America, the method of preserving apples is by laying them on a floor, and merely covering them with a linen cloth, which has been found to secure them from both frost and damp; the same effect will not be produced by a woollen cloth.

A curious manner of preserving chesnuts, but which is said to be efficacious, is by mixing them with walnuts.

ON THE NECESSITY OF PROTECTING POOR BUT TALENTED ARTISANS, &c.

We adverted, in a former Number, to a subject which, from its nature and apparent importance, seems eminently calculated for serious discussion and consideration; we allude to the hardships and difficulties to which poor but talented men are necessarily subject by their exclusion from the protection afforded by the laws of patent right. Founded as these laws may be, in legislative wisdom and national policy, it may perhaps appear absurd to raise a question at the present day upon so delicate a matter; but we think, that a calm and fair consideration of the subject, among those who are most qualified and best fitted to the task, may, if it do no positive good, at least lead to ultimate advantage, and be the means of alleviating the weight of a grievance which those who feel it most are able least to deprecate.

In considering this subject, it would hardly be necessary, indeed our restricted limits would preclude us from entering into any very diffuse or excursive examination of the origin or history of these laws, but, as it naturally enough involves an inquiry into their nature and efficacy as a political measure, and as they are perhaps but little known to that class of persons whom they most intimately interest, and for whom they are mainly intended, we shall, as briefly as may be, revert to the cause of them, and to the consequences which that cause appears most calculated to elicit.

If useful discoveries were for ever concealed from the public eye, and only made subservient to individual interests, the mischief would be immense and incalculable, and it would rest as a matter of social expediency, to hold forth to persons in whom they originated a valuable consideration for the benefits to arise by their universal publicity. The most useful inventions which have been made in the arts and manufactures of the land, have resulted not so much from the meditative speculations of philosophers, as from the labours of mechanics practically conversant with the subjects of their ingenuity. Of those, therefore, whose means of subsistence lie only in the exercise of professional skill and ingenuity, it would be hard indeed to expect an unproductive sacrifice of their labours—labours which, although nationally beneficial, might become, to themselves, generally embarrassing, and oftentimes ruinous. It may, however, be urged, as an abstract argument, that, although such a measure would be probably a measure of strict equity and political economy, thus to secure a general benefit, by assuring a protection to individual ingenuity, it would nevertheless weigh but lightly as a stimulus to men of inventive dispositions; and for these reasons that they are little shackled by anticipatory difficulties in the way of ultimate pecuniary emolument; and that their object is not so much to reap a positive profit, as to afford to themselves a source of rich and permanent delight, regardless and unmindful of prospective misery.—All this may be very true; but it is a very weak, and a very graceless mode of reasoning, to boot, and it only needs to go a step farther at once to see that these considerations will, and absolutely must, go to the subversion of mental exertions. A man, deeply impressed with the probable practicability of a particular theory, may, to a certain point, give to the thing his undivided energies and labour; and, having thus far proceeded, be obliged to relinquish all farther pursuit, in the better conviction that he must then consider himself as bereft of that support, without which to proceed would not only be fruitless, but, with relation to his domestic necessities, to a certain extent, criminal—when, on the other hand, had he been upheld by the certainty of protection upon the completion of his labours, he might else have effected an object reciprocally advantageous to others generally, and to himself individually, and, to step farther, have thus been placed in a situation to cultivate those faculties which, unnourished, must needs fall to waste and gradual decay; and this consideration alone would surely seem to go to prove that any difficulties under which the great majority of clever artificers'

labour, must necessarily tend to cramp and enervate their genius and exertions.

There is another consideration, too, which, although it does not legitimately arise in this stage of the matter, nevertheless presses strongly upon the mind, and that is the dishonest and disreputable advantages which are too frequently taken by designing individuals, of unassisted and impoverished talent. What upon earth, we ask, can be more sad or sickening to the heart of man than the knowledge that after all the days and weeks—it may be months, of severe mental and bodily travail; after all the hours of harassing anxiety and unremitted toil; after nights and nights of sleepless and busy and agitating thought, spent in all the ardour and devotedness of a steady and unbroken enthusiasm, weakened by labour and embarrassed by difficulties;—at once to see the object of all his deep deliberations and fondest hopes wrested from him by another, and forming the corner-stone of a stranger's aggrandizement. Now, surely, in a land where Science and the Arts reign triumphantly pre-eminent, this should hardly be tolerated. Surely, redress in such a case, in such a cause, is attainable?—and it is—but by whom?—by the poor and needy Artisan?—let him look at home—his wife, his family—his means—fighting hard battles with distress, and struggling for subsistence. Where is his redress; where his remedy, or hope? The common polity of the thing would therefore seem to involve the necessity of a certain protection from these partial but afflictive grievances: but when we consider the enormous expenses incident to the attainment of such a protection, and the immense difficulties which interpose themselves to it, we at once perceive, that to the greater mass of individuals these expenses must necessarily amount to a direct preclusion, and where this preclusion for one moment exists, the fair and only inference seems to be, that inertness and relaxation will be the natural and necessary consequence.

We all know, however, that individual advantage must yield to general interest; and, in order to take a proper view of the matter, we must beg the question that this principle alone stands in the way of the relief. The nation, *in toto*, has as just a claim for protection upon the Government as any one of its members *particularly*, and would have as rightful a cause of complaint in becoming non-participant in it as any one individual solely.

Without going into a technical definition of the term, a patent may be considered to be a privilege of monopoly for a certain term of years, granted to inventors by the Crown, in consideration of the advantages which may be derivable to the State, by the discoveries to be in consequence divulged; and upon this ground—that the necessity of affording to men of genius a certain duration of monopoly in the fruits of their labours is unquestionable, and that the principle is founded as much in natural justice as in sound policy.

But as all monopolies are prejudicial to the individuals of a nation *generally*, we must consider the question in another point of view.

[*To be continued.*]

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

INCREASING OF STEAM.—To the person who shall invent steam engines that require less fuel than has hitherto been employed, provided that in general the risk of accidents be not increased, and the whole amount of the expenses in using steam engines be considerably lessened. The Gold Medal, or Fifty Guineas.

TEST FOR ARSENIC.—To the person who shall discover to the Society a test for arsenic in solution, superior to any hitherto known. The Gold Medal.

CROWN GLASS.—To the person who shall make crown or window glass equally transparent, and as free from blue and green colour as the best German sheet. The Gold Vulcan Medal, or Thirty Guineas.

PREVENTING THE DRY ROT IN TIMBER.—To the person who shall discover to the Society a certain method of preventing the dry rot in timber superior to any hitherto known. The Gold Medal, or Thirty Guineas.

RECENT PATENTS.

To JOHN VALLANCE, of Brighton, in the county of Sussex, Esq. for his new-invented method of communication, or means of intercourse, by which persons may be conveyed, goods transported, or intelligence communicated from one place to another with greater expedition than by means of steam carriages, steam or other vessels, or carriages drawn by animals. 19th Feb. Six Months.

To WILLIAM CHURCH, of Birmingham, in the county of Warwick, Esq. for his invention of certain improvements in machinery for printing. 19th Feb. Six Months.

To THOMAS BEWLEY, of Mount Rath, in Queen's County, Ireland, cotton manufacturer, for his invention of certain improvements in wheeled carriages. Sealed 24th January. Six Months.

To JOHN ARROWSMITH, Esq. of Air Street, Piccadilly, in consequence of discoveries by himself, and communications made to him by certain foreigners residing abroad, for an improved mode of publicly exhibiting pictures, or painted scenery of every description, and for distributing or directing the daylight upon or through them, so as to produce many beautiful effects of light and shade, which he denominates Diorama. 10th February. Six Months.

To SIR WILLIAM CONGREVE, of Cecil Street, Strand, in the county of Middlesex, Bart. for his invention of an improved method of stamping. 7th February. Six Months.

TO OUR READERS AND CORRESPONDENTS.

If "John H**y**n" will send us a sketch of his screw, accompanied with his observations upon it, we will readily give to it such attention as it shall appear to demand.

There are many ways of describing an ellipsis. T. D. had better refer to some work on geometry which will remove his difficulties; the simplest method we know is that of a *trammel*, with which any carpenter could make him acquainted.

We really do not know what to say to E. A. J. He had far better apply to his immediate friends for advice as to the best course he should take. If his contrivance be of *that* importance he should protect himself by means of a Patent.

Communications have been received from U. S.—Y.—T. Holt.—Frederick.—J. B.—S. X.—Enquirer.—Mr. Murray.—An Engineer.—J. J. L.—H. G.—C. N.—Johannes—and Verax.

A "Constant Reader requests information upon the subject of grinding and polishing lenses. We believe some improvements upon the usual method have been lately introduced, and we will be glad to learn the nature of the best means at present employed.

Φ has been received, and will appear in our next—his drawing is already in the engraver's hands.

[*To be continued every* Fortnight.]

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Printed by T. H. Coe, Little Carter Lane, St. Paul's.

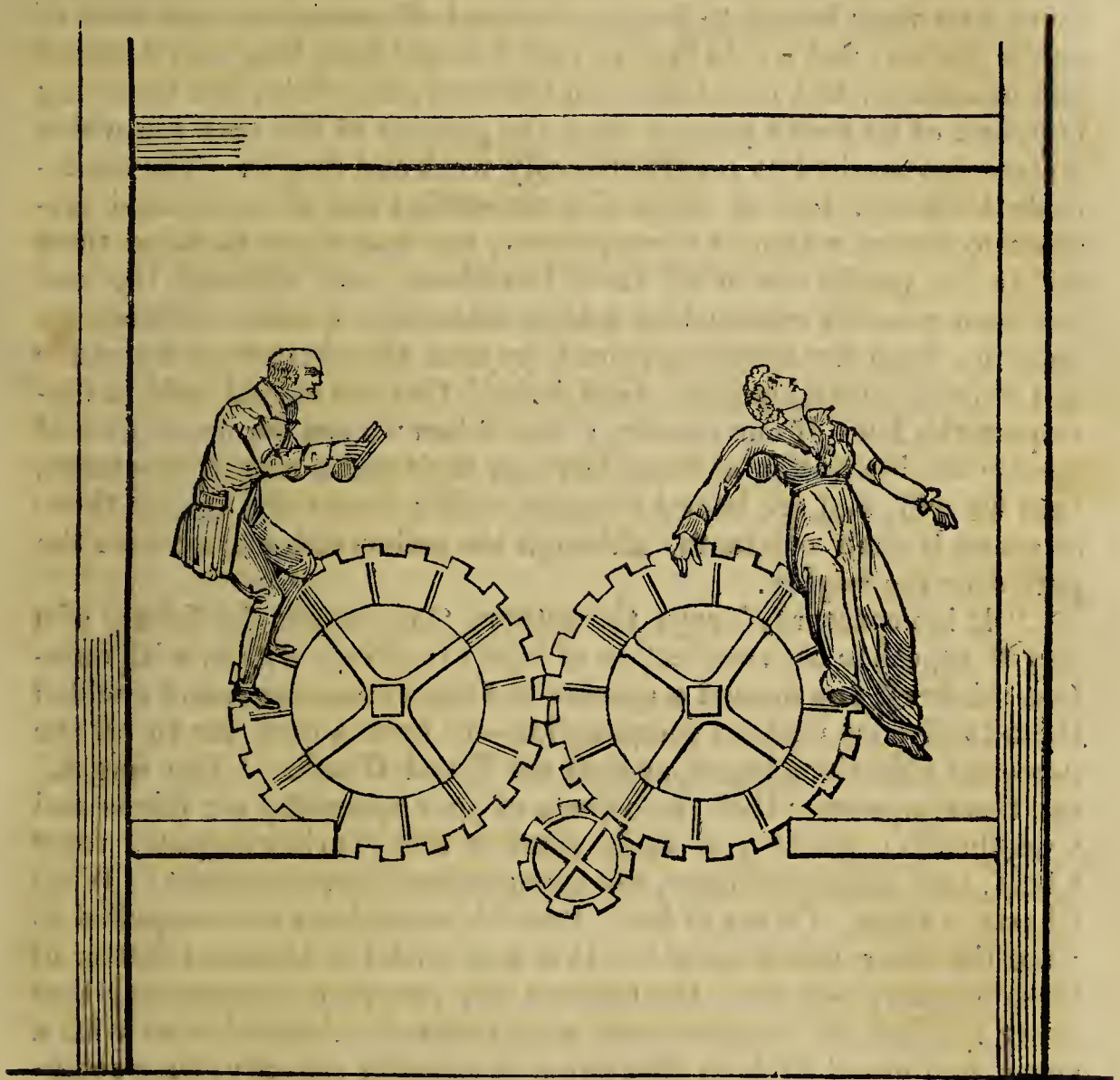
REGISTER

OF

THE ARTS AND SCIENCES,

IMPROVEMENTS & DISCOVERIES.

No. 12.] SATURDAY, MARCH 20, 1824. [Price 3*d.*



THE TREAD MILL.

The subject of the above engraving is at present shaping itself into so purely a controversial nature that it is, we believe, considered less in the light of a mechanical engine than in that of an instrument of torture, befitted better to the black purposes of despotic rule than to the penal visitations of a noble, free, and civilized land; and, we frankly confess, that in noticing the thing, it is less intended as the object of mechanical study, than for the purpose of asserting, as Englishmen should do, our abhorrence of its use, as the inflicting hand of that justice, which, it is the proud boast of England, is so tempered with wisdom, propriety, and mercy.

A pamphlet has been put into our hands, purporting to be the "THOUGHTS ON PRISON LABOUR," of a *Student of the Inner Temple*, and in whatever way the matter has been handled by him, we think all parties must concede to him the credit of a warm and honest heart. He has discussed it, we think, fairly and at some length; indeed the subject is well fitted for lengthy investigation and remark, as it necessarily involves in it the very first principles of a penal code of laws; the subject has, however, produced a good deal of angry and impassioned feeling, which we should have thought could hardly be allowable in those who were bound to be the calm and dispassionate ministers of public justice, and we do believe that it would have long lain dormant and unnoticed, had it not been for the cruel, impolitic, and harassing infliction of its heavy powers upon the persons of the very sex which Nature has marked as constitutionally weak and fragile. The intolerable hardship, too, of subjecting an untried and uncondemned prisoner to the operation of these powers, has done much to bring them before the public eye in all their fearfulness, and although the load has been recently removed by a high authority, it takes nothing, we imagine, from the feelings evinced by such the abettors of its undue and unjustifiable adoption. God forbid! that we should hold in disrespect the laws of our country; but, when we see the improper and unwise administration of those laws, or their unsanctioned execution, then we will, and are bound to speak with a loud voice against those in whom it shall originate, although the malversation arise with the potent or the mighty.

"It is neceesary," says the author, "to expose the fallacy of a sort of appeal to our recollection of injury received, which, with indolent thinkers, has formed a quietus to their consciences, and enabled them to dismiss without compunction—to turn a deaf ear to all the powerful objections urged against the Tread Wheel. 'You forget,' say these arguers, 'that the objects of your sympathy are felons and 'vagabonds; would you make comfort and Turkey carpets, roast 'beef, and plumb puddings, the appendages of imprisonment? What 'harm is there, if a set of lazy, thievish scoundrels are compelled to 'fag till their bones ache?' It is not with the apparent matter of these queries, but with the manner and its evil consequences, that every rational and humane man must quarrel. Accompanied with a sneer, and urged with an affectation of superior sagacity, they sometimes serve the purpose of crushing all inquiry whatever. They, who would abolish the Tread Wheel labour, do not feel more for its objects than is proper; they are not infected with a maudlin sensibility, but have made a stride beyond their fellows in their disenthralment from some of the too antiquated modes of acting and thinking, which yet mingle with, and mar our high national polish and preeminence."

The only thing for consideration is, of course, the simple question, whether the Tread Mill is, in reality, a punishment improper for and destructive to human health, or fitted to general and indiscriminate cases, applicable alike to the muscular and grasping strength of a man, and the poor strivings of a weak woman? without going at all

into the policy or impolicy of meting out a severity of labour to a criminal, or winning him to virtue by mild and expostulatory means, we at once say, that if there be a doubt, or the shadow of a hazard, such mode of punishment should and ought to be abandoned.

Now when we glance over the evidence of the many reports made by various gaols, and see the grievous consequences of its imposition, we must be directly convicted, that the discipline employed will be considered as more of an avenging than of a chastening character, and, as such, be regarded as incompatible with the fine laws of a great nation.

[*To be concluded in our next.*]

ON DISTILLATION.

(Continued from page 164 in the last Number.)

Brandy.—The genuine spirit is distilled from wine (properly so called, being the wine of grapes), also from the lees of wine, and the husks of the grapes, which remain after pressing out the juice. The usual apparatus is employed, of a still that holds five or six quintals, with a capital and worm applied in the usual manner.

Brandy has a purer and more vinous taste than other spirits; its peculiar flavour, no doubt, depends on the nature of the volatile principles, or essential oils, that rise in distillation with the pure spirit, and likewise in some measure upon the wood of the cask in which it is kept.

The Brandies made in France are much preferred to those of Spain and other countries. This preference is, perhaps, as much owing to superior distillation, as to certain peculiarities in the flavour of the grapes, which differ on every soil and in every climate. In the South of France alone, there is a great variety in the grapes, as well as in the quality of the spirit extracted from them. Some wines are *considered* totally unfit for distillation, others peculiarly suited for it, and unfit for wine. When the fermentation has proceeded too far, the wine is put into the still, and the spirit extracted; otherwise the acetous acid, by the continuance of the fermentation, would be soon produced in such abundance, as to turn the whole liquid into vinegar. The inferior weak wines are generally employed for the making of Brandy, from their containing too little spirit to keep them; and the good, strong wines, are generally reserved as yielding a far ampler profit, than could be obtained by the extraction of their spirit. The most spirituous wines of France, are those of Languedoc, Guienne, and Rousillon, which yield, according to Chaptal, from twenty to twenty-five gallons of excellent Brandy out of a 100; but those of Burgundy and Champagne much less. Brisk wines, which contain much carbonic acid, from the fermentation having been stopped at an early period, yield the least spirit.

The Brandies generally esteemed as the best and finest flavoured are those distilled from the grapes which are the produce of the territories of Cogniac and Andaye. Hence every wine merchant in

England is professedly stocked with the "*real Cogniac*" Brandy; and thus every public-house sells no other Brandy than the "*best Cogniac*;"—even the distiller himself has the "*genuine Cogniac,*" which he will tell you he has received "circuitously," and truly so, for it has made all the revolutions of his still-worm in its passage to him.

In distillation, the three principal distinctions, in the various strengths of spirits, are described, by the terms, low wines, proof spirit, and alcohol. *Low wines* consist of one-sixth of pure spirit or alcohol to five of water;—*proof spirit* consists of one half of alcohol and one half of water;—and *alcohol,* wholly of pure spirit.

Alcohol. This is a chemical term, denoting the strongest spirit that can be obtained; the *spirit-of-wine* of commerce is only an approximation to the state of alcohol, and it is found in the shops of every degree of strength above that of proof spirit, but divested of all colour. It is obtained merely by a re-distillation of proof spirit;—but to free spirit-of-wine, as much as possible, from the water with which it is always more or less combined, and to bring it to the state of alcohol, the aid of other processes besides that of distillation are necessary.

To obtain pure alcohol, Rouelles (a very able French chemist) recommends, to draw off half the spirit in a water bath, to rectify this twice over, drawing off two-thirds each time; then to add water to this alcohol, which will turn it milky by separating the essential oil still remaining in it; afterwards to distil the spirit from the water, and rectify it by another distillation. Alcohol is not, however, in this state quite pure, it may yet be freed from a portion of water by means of an alkaline salt. For this purpose, muriate of soda (common salt) may be advantageously employed, by first depriving it of its water of crystallization by heat, and adding it hot to the spirit. The subcarbonate of potash is however considered to be preferable. About a third part of the weight of the alcohol should be added to it in a glass vessel, be well shaken, and then allowed to subside. The salt will be found to have absorbed water from the alcohol, which being decanted, more of the salt is to be added, and the process continued until the salt falls dry at the bottom of the vessel. The alcohol must now be subjected to a final distillation in a water bath, to deprive it of the red tint obtained from the potash, as well as from the alkali held in solution. Dry muriate of lime will have the same effect of abstracting the water from the alcohol, as the alkali just mentioned.

Alcohol being much lighter than water, its specific gravity is used as a test of its purity. Fourcroy considered it as rectified to the highest point when its specific gravity was 829, that of water being 1000; and this is perhaps nearly as far as it can be carried by mere distillation; by the addition of alkali it may be brought to 813, at 60 Fahrenheit. According to the London College it should be 815.

The uses of alcohol are various; it dissolves with great facility the resins and essential oils, also camphor, bitumen, and various

other substances, which renders it of great service in pharmacy, in various other arts, and to the perfumers in particular. When diluted with an equal quantity of water, constituting what is called proof spirit, it is used for extracting tinctures from vegetable and other substances :—the alcohol dissolving the resinous and the water the gummy parts. From its giving a steady heat without smoke, when burned in a lamp, it is extensively employed for heating water on the tea-table ; and in many chemical operations, it is found extremely useful. It is in common use in preserving anatomical preparations, and many subjects of natural history.

MR. OLLERENSHAW'S HAT-DRESSING MACHINE.

Mr. Ollerenshaw, of Manchester, has taken out a Patent for a Machine for assisting in the dressing and finishing of Beaver or Felt Hats, by which the ordinary labour in those operations is materially reduced, and the work is completed in much less time.

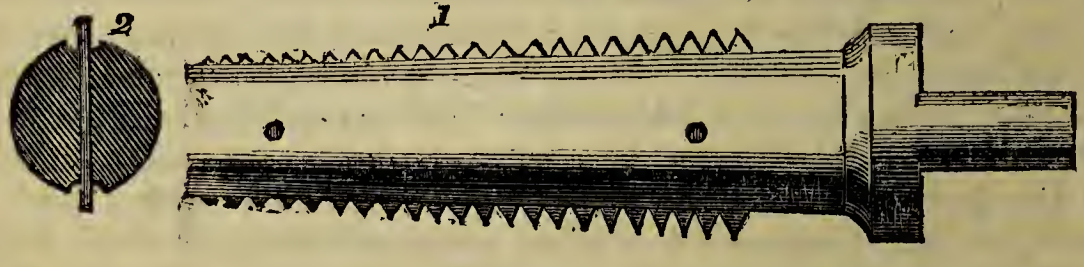
It is constructed on the principle of the Lathe ; and the apparatus consists of three principal parts, or lathes, which are all fixed in one strong frame, and motion is given to them by means of a band passing from any first mover, (as a steam-engine, water-wheel, &c. &c.) The first of these lathes is constructed the same as the common wood-turners' lathe, and is used for the purpose of ironing or dressing the sides of the crown ; the block upon which the hat is fixed is made to fit on the chuck of the lathe, and, as the hat revolves, the hot iron is applied to the surface by the workman, which quickly smooths the hat, giving it the usual glossy appearance ; the velvet cushion, and the various brushes hatters use, are likewise applied, as may be required, while it is thus revolving, till that part of the hat is finished, when it is removed and placed upon the block of the next lathe. This second lathe is constructed with a vertical shaft, so as to produce a horizontal rotary motion to the hat, which is better suited for operating upon the flat part of the crown and the upper side of the brim than a vertical motion. The hat having undergone the usual manipulations in the second lathe, is removed to the third, where it is introduced in an inverted position into a frame made to receive it, which turns round very slowly, in a horizontal direction, (the axis being vertical.) Here the workmen smooth the under-side of the brim, by drawing the iron across it, from the centre outwards. The hat next undergoes the usual examinations and pickings-out of the extraneous and coarse hairs ; after this, it is again subjected to the former operations of ironing and brushing, which finishes it.

The Patentee considers his Patent-right to consist in the application of " mechanical power to give a continuous, circular, or rotary motion to the hat, at the same time that the workman holds and applies the face of a heated iron thereupon, &c. &c."

CONTRACTING AND EXPANDING FENDERS.

Some time since, a Mr. Ibbotson, of Sheffield, took out a patent for an invention of a Fender, capable of being extended or contracted in length, so as to fit fire-places of different dimensions,' but, unfortunately confined himself to a description of that mode of effecting it which he preferred, and had adopted; namely, that of causing the parts of the Fender to slide in "*straight lines.*" In consequence of Mr. Ibbotson's omission to notice the other obvious means by which the ends of the Fender might be extended or contracted, Mr. Edward Eyre, who is another manufacturer at Sheffield, took out a patent a few months since, for "extending or contracting" a fender in "*curved lines.*" The moveable ends of Mr. Eyre's fender being attached to the front by means of pivots, or hinge joints, so that the ends move in arcs of circles, or in *curved lines.* Mr. Eyre, however, has taken care in his specification to claim "every method by which this invention can be carried into effect."

For our own part we are at a loss to conceive upon what ground such a patent as Mr. Eyre's can rest; as wire-guards, which is only another term for a high fender, have been in use for a number of years, constructed with hinge joints, or pivots, for extending or contracting them as may be required: but Mr. Eyre, perhaps, calculates upon the preference given by some persons to every article bearing the name of *patent,* under the mistaken idea that patents are granted only for improvements.



MR. SIEBE'S TAP FOR CUTTING HOLLOW SCREWS.

In describing this simple and useful little invention of Mr. Siebe's,* we avail ourselves of the account published in the forty-first volume of the Transactions of the Society of Arts.

Screws vary from each other, not only in magnitude, but in the direction and complication of their threads; hence there are right and left-handed screws; also single, double, and treble screws. The apparatus of Mr. Siebe enables the workman, with the same tool, to form either right or left, single, double, or treble hollow screws of the same diameter. The screws capable of being made by this implement are far from being mathematically accurate, but will be found to be quite as good as the hollow screws made in the usual way, and adapted to the use of various wooden articles of domestic furniture, and to the common kinds of machinery.

* Mr. Siebe, of the Strand, London.

The Tap is a thin quadrilateral piece of steel, of the length and breadth of the required screw, having its longitudinal edges cut into saw teeth; the teeth in one row being opposite to the intervals in the other, and therefore representing a section of a screw, the teeth being sections of the threads. A cylinder of hard wood is turned, so as to correspond with the dimensions of the intended screw, and a longitudinal piece being sawn out from the middle, representing a section through the axis, the serrated plate is to be inserted, and firmly rivetted into its place. The cylinder terminates in a flat head, for the purpose of *receiving a key*, or lever, which enables the workman to overcome the friction experienced in cutting the screw.

In order to use this tool, a cylindrical hole, equal in diameter to the cylindrical stem, is to be bored in a piece of wood, and the serrated cylinder being then introduced, giving it a circular or spiral motion, will form a right or left-handed screw, according to the direction in which it is turned; and by entering two or three threads at once by means of the common V tool, the same Tap will give a double or treble threaded screw.

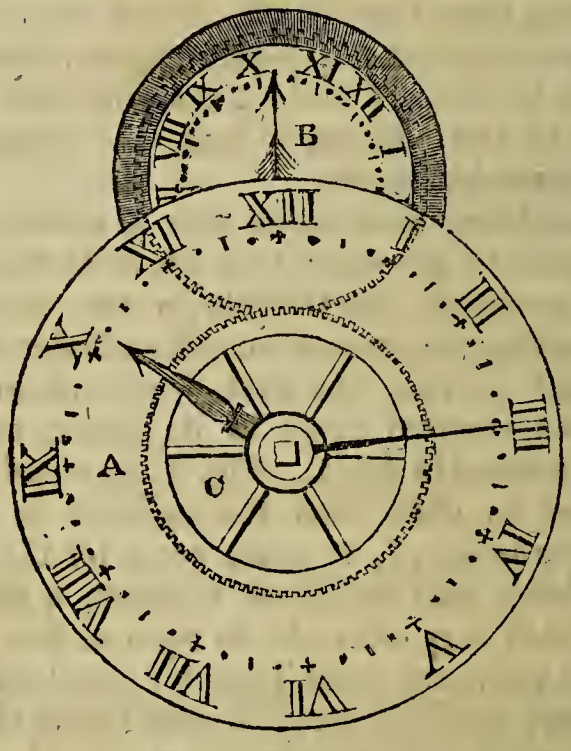
The hard wood being first made into a screw, the blade is rivetted in, and the teeth are made by a file to fit the wooden threads; the blade is then removed, the threads in the wooden cylinder are then turned off, leaving the stem a smooth cylinder; the blade is then tapered at the point so that the first teeth are no bigger than the cylinder; it is then rivetted again in its place, and the instrument is complete, as exhibited in fig. 1. Fig. 2 is an end view of the same, which is exhibited to shew that the cylinder is cut away a little, where the teeth are inserted, to make room for the shavings; as the cylinder fits the hole, and the blade is taper, a gradual and steady cut is secured, which may either be to right or left hand.

Mr. Siebe also proposes steel Taps for metal screws, to be made in the same manner, by filing away a solid screw of metal, so as to present two cutting edges, similar to those attached to the wooden cylinder. We have not thought it necessary to give our readers a drawing of this part of the subject, as the figure is necessarily very nearly the same, and, as we doubt not, our mechanical readers will agree with us, that it cannot answer so well as the common Tap in general use for cutting hollow screws in metal. We nevertheless feel satisfied of the merit of Mr. Siebe's *Screw Tap for Wood*, and that that alone well deserved the approbation and reward conferred upon the inventor by the Society of Arts.

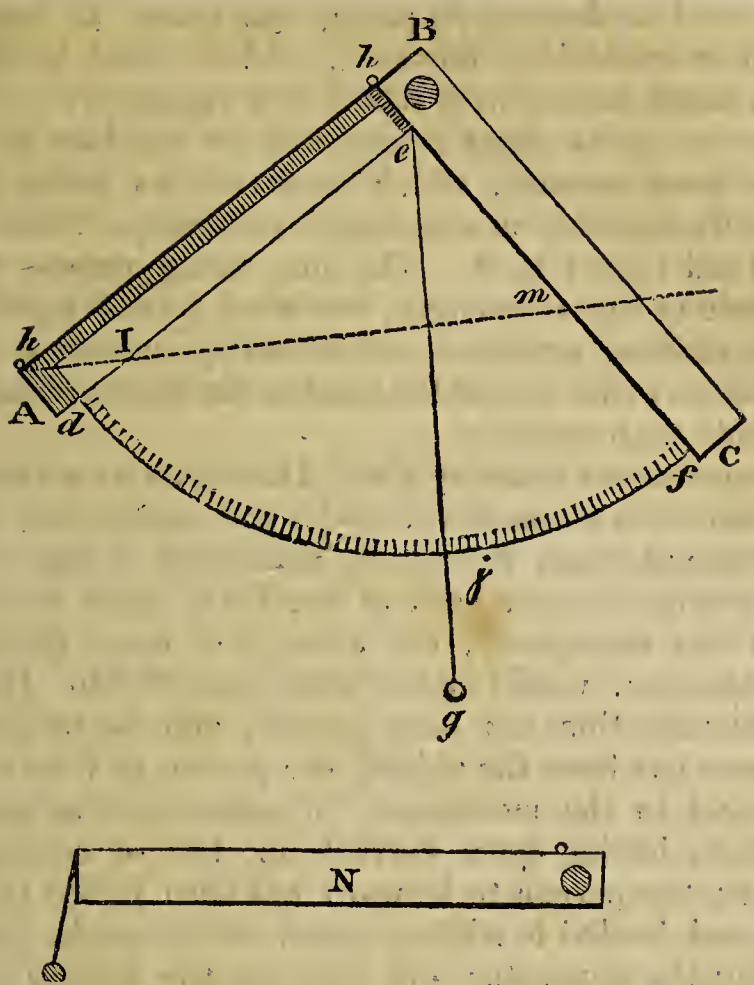
A Screw has, we understand, been invented by M. Lewis Gomputz, the threads of which are quite perpendicular on the side intended to bear the pressure, and the other side being twice as much inclined as is usual; thus uniting the strength of the common angular thread with the chief advantage of a flat or square thread, viz. of saving the nut from splitting, and causing but little friction; the nut of course being upon the same plan.

PLAN FOR ILLUMINATING THE PUBLIC CLOCKS.

In the Tenth Number of our Register, we inserted an account of a plan for Lighting the Public Clocks at night, which was sent to us by a Correspondent. To that account we appended a note, stating that we had an idea of another plan, by which this desirable object might be effected, which we proposed to submit to our Readers in the following Number. An accident, however, occurred to the wood-cut, which obliged us to postpone the insertion of our humble contrivance until the present; and we now put it forth infulfilment of our obligation, and with the hope that it may elicit something more worthy the attention of the Public, from some of our ingenious Correspondents.



A is the dial-plate of a common clock, with the hours, &c. marked upon it, as usual; B is the proposed addition to it, for the purpose of exhibiting the time distinctly during the night; C is a light cog-wheel, placed immediately behind the day dial, having its centre fitted in the arbor of the hour-hand, and revolving with it. The night dial B we propose to be made of a plate of glass, with the hours painted upon it in black, and to revolve on an axis in its centre. The index, represented by an arrow, is fixed. The periphery of the glass plate is encompassed by a rim of brass, having cogs in its outer edge, which fit into the cogs of the wheel C; consequently they move together; and being of equal diameters, they perform their revolutions in equal time. The time represented in our engraving is a quarter past X; when the hour-hand has moved on to XI, (for instance), the transparent dial B will have moved an equal space past the fixed index, and denote the same precise time. Both dials must, by this simple contrivance, invariably agree in their respective indications of the time. During the day the time is observed on the large dial, as usual; and at night a lighted lamp placed behind the transparent dial will always exhibit the time as distinctly.



A SIMPLE AND EASILY CONSTRUCTED INSTRUMENT FOR OBSERVING THE HEIGHT OF OBJECTS, &c.

A B, B C, two equal pieces of wood turning on a screw at B, *e d f* a slip of parchment or paper pasted to the legs A B, B C, and folding between them when closed, after the similitude of a fan. Let the outer part *d j f* be made the quadrant of a circle to radius *e d*, and let it be divided into 90 degrees; *e j g* a plumb-line falling from the centre C *h h*, two sights. If through *h h*, the top of any object be observed, the plumb-line *e j g* will cut off the No. of degrees (*j f*) contained by the angle of elevation. The proof is very evident. Let *h I m* be the horizontal line, to which *e j g* will always fall perpendicular: and since *I e m* is a right angled triangle, ∴ (Eucl. vi. 8) L fig. = L *e I m* = L of elevation. The instrument may be closed as N, as carried in the pocket. Φ

CAPTAIN DANSEY'S KITE,

For effecting a Communication between a stranded Ship and the Shore, or under other Circumstances, where badness of Weather renders the ordinary means impracticable.

A sail of light canvas or holland, is cut to the shape and adapted for the application of the principles of the common flying Kite, and is launched from the vessel or other point to windward of the space over which a communication is required, and as soon as it appears to be at a sufficient distance, a very simple and efficacious mechanical

apparatus is used to destroy its poise, and cause its immediate descent; the Kite remaining, however, still attached to the line, and moored by a small anchor with which it is equipped.

The Kite during its flight is attached to the line by two cords placed in the usual manner, which preserves its poise in the air; and to cause its descent, a messenger is employed, made of wood, with a small sail rigged to it. The line being passed through the cylindrical hole of this messenger, the wind takes it rapidly up to the Kite, where, striking against a part of the apparatus, it releases the upper cord, and by that means the head of the Kite becomes reversed, and it descends with rapidity.

In the experiments made by Capt. Dansey, with a view of gaining communication with a lee-shore, under the supposition of no assistance being there at hand, a grapnel, consisting of four spear-shaped iron spikes was fixed to the head of the Kite, so as to moor it in its fall; and in this emergency, the attempt of some person to get on shore along the line, would be the means resorted to. In those cases where a communication has been gained, and the maintenance of a correspondence has been the object, the person to windward has attached a weight to the messenger, in some cases as much as three pounds, which, having been carried up, has of course descended with the kite; the person to leeward has then furled the sail of the messenger, and loaded it with as much weight as the kite could lift, then replacing the apparatus and exposing the surface of the kite to the direct action of the wind, it has rapidly risen, the messenger running down the line to windward during its ascent.

The kite with which Captain Dansey performed the greater part of his experiments, extended 1100 yards of line $\frac{5}{8}$ of an inch in circumference, and would have extended more, had it been at hand. It also extended 360 yards of line $1\frac{3}{4}$ inch in circumference, and weighing 60lbs. The holland weighed $3\frac{1}{2}$lbs.; the spars, one of which was armed at the head with iron spikes, for the purpose of mooring it, $6\frac{3}{4}$lbs., and the tail was five times its length, composed of 8lbs. of rope and 14lbs. of elm plank. For a more particular description of Captain Dansey's Apparatus, we must refer our Readers to the 41st volume of the Transactions of the Society of Arts, where it occupies eight pages, besides the engravings. Captain Dansey has deposited a complete apparatus with the Society, who have very properly presented him with their gold Vulcan medal, for his valuable invention and communication.

THE ELEMENTS OF NATURAL PHILOSOPHY,

(Continued from page 141.)

No. 8.—Hydraulics.

Hydraulics is the laws of fluids in motion, and is founded upon the principles of Hydrostatics; it teaches us how to estimate the swiftness and force of fluids in motion.

The rules for spouting liquors are these:

The force which makes water spout from a hole in a vessel containing water, is proportional to the depth of the hole, or its distance from the surface of the water in the vessel: because the pressure of the water in all points is proportional to its depth.

The quantities of water spouting in the same time through equal holes with different uniform velocities will be proportionate to those velocities.

The quantities of motion passing through equal holes in the same period of time are in compound proportion to the velocities and quantities of matter; *ex. gr.* as the squares of the velocities, or of the quantities of water.

The forces are proportional to the quantities of motion generated in the same time; that is, to the squares of the velocities, or of the quantities of water: the depths are, therefore, as the squares of the velocities, or of the quantities of water.

The quantities of water passing through equal holes in the same time are in sub-duplicate proportion, or as the square roots of the depths.

The velocity of a drop of water spouting through a hole will be equal to the velocity which it would acquire in falling perpendicularly through a space equal to the depth of the hole.

Water will rise in pipes (if bent upwards) as high as the surface of the water: because a body falling through any space acquires such a degree of velocity as would make it ascend to the same height again.

The velocity of water descending through a hole in the bottom of a vessel will be greater than the velocity of a horizontal jet spouting from the same depth; and the velocity of the horizontal jet will be greater than the velocity of a perpendicular jet.

These are some of the fundamental laws of Hydraulics.

The velocity with which water spouts from a hole at the side, or in the bottom of a vessel, is, as the square root of the depth or distance of the hole below the surface of the water; for in order to make double the quantity of a fluid run through one hole as through another of the same size it will require four times the pressure of the other, and therefore the aperture must be four times the depth of the other below the surface of the water; and for the same reason, three times the quantity running in an equal time through the same sort of hole must run with three times the velocity, which will require nine times the pressure, and, consequently, the hole must be nine times as deep below the surface of the fluid, and so on.

As a proof of this, the following experiment can be tried:—Let two pipes of equal-sized bores be fixed into the side of a vessel, one pipe being four times as deep below the surface of the water in the vessel as the other is; and while the pipes run, let water be poured constantly into the vessel so as to keep it always full. Then, if a cup that holds a pint be so placed as to receive the water that spouts from the upper pipe, and at the same moment a cup that holds a quart be placed to receive the water from the lower pipe both cups will be filled at the same time by their respective pipes.

The horizontal distance to which a fluid will spout from a horizontal pipe in any part of the side of an upright vessel below the surface of the fluid, is equal to twice the length of a perpendicular to

the side of the vessel drawn from the mouth of the pipe to a semicircle described upon the altitude of the fluid; and, therefore, the spout will be to the greatest distance possible from a pipe whose mouth is at the centre of the semicircle; because a perpendicular to its diameter (supposed parallel to the side of the vessel) drawn from that point is the longest that can possibly be drawn from any part of the diameter to the circumference of the semicircle.

Fluids, by their pressure, may be conveyed over hills and valleys in bended pipes, to any height, not greater than the level of the springs whence they flow. Of this fact, the ancients were altogether ignorant. The expedient of *aqueducts*, (vast rows of arches, one above another between two hills) was therefore resorted to at an enormous expense, both of money and labour, in order to convey water across the valley beneath.

[We shall go fully into the nature of *Syphons* in our next.]

MISCELLANEOUS.

American Iron.—A sample of rolled iron was lately sent to England from New York, as an experiment in reference to its singular properties. It was manufactured from the Peru ore, at the Russian Iron-works, on the river An-Sable. It is pronounced equal to the best Archangel iron, and superior to any other in the world in the essential property of welding. Orders of considerable amount have, in consequence, been received from England.

Distillation of Sea Water.—Mr. Clement, a French chemist, has constructed a still, by the use of which at sea, from six to seven tons of pure water may be obtained, with the consumption of only one ton of coal.

Remedy for Consumption.—A young lady, apparently in the last stages of decline, and supposed to be affected with hydrothorax, was pronounced to be beyond the reach of ordinary medical aid, when it was determined to administer oxygen gas. The gas was obtained from nitrate of potass (salt petre), not because it was best suited, but on account of its being at hand, and as it required merely a common fire for its extrication. The gas obtained, had of course, a variable mixture of nitrogen and azote, probably, about seventy or eighty per cent. of oxygen to twenty or thirty of nitrogen; and it is worthy of consideration whether this circumstance might not have influenced the result. The gas was skilfully prepared and perseveringly used, and, contrary to expectation, the difficulty of breathing, and other oppressive affections were speedily relieved. The young lady grew rapidly better, and in a few weeks entirely recovered her health.

[*Dr. Silliman's Am. Jour.*]

Inebriety.—Dr. Petier, a German physician, states that he has found the spirit of hartshorn in the dose of a small tea-spoonfull in a glass of water, to encounter the inebriating effects of strong fermented liquors, and in an hour or two recover a person from an apparently lifeless state through excess of wine.

ON THE NECESSITY OF PROTECTING POOR BUT TALENTED ARTISANS.

[*Continued from No.* 11, *page* 175.]

The Government of a country being bound by its office to do all that shall be necessary to the common welfare and advantage, is necessarily compelled to put the nation in possession, by every means in its power, of whatever may tend to that result; and, to bring the proposition home to the present question, if the Government see that a general benefit may probably result from the introduction of a particular invention or discovery, it is fully justified in making a trifling sacrifice on the part of the nation to secure that benefit to the greatest possible extent. It is upon this principle that a partial monopoly is granted to an inventor in consideration of the disclosure which he offers to make for the public good; and although the nation is excluded for a certain time from participating in its full results, it will nevertheless be the gainer ultimately, by the disclosure of a secret of which it was not before in possession*. It is this tenacity of a nation's right which makes the laws so severely scrutinize the question of a new discovery, and so pertinaciously to insist upon a full, clear, and explicit disclosure and specification of the discovery, for which a Patent is thus sought to be obtained. The benefit to the Public is the complete and efficient disclosure as to the particular manner, method, and process, to be adopted in the formation of the manufacture or matter to be protected, so that at the expiration of the period of a Patent the world may be thoroughly possessed of the available means adopted by the inventor for effecting his object: and this provision has the two-fold object of divulging to the Public an important secret, and of opening the door to the inquiry whether the party seeking protection is the true and only discoverer of it, and a fit and proper person to claim protection; for, if it can be proved that an invention was publicly known, (however partial that publicity might be), the claimant is no longer held to be worthy of that protection. The monopoly granted to him would in that case be considered "as both hurtful to trade and mischievous to the State—hurtful to trade as confining the use of an article to one person for a certain period, which was before known to others, who might during that time have disseminated it to the various persons engaged in that trade, if not prevented by the Patent—and injurious to the State, as, by granting the exclusive benefit of a thing already used by, or known to, the Public, the patentee could not pay for his privilege in the coin required by the Patent, namely, a disclosure of a *new* invention,

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* In the cause of Cartwright against Amatt, relative to a patent granted for a new process of Combing Wool and similar articles, Lord Eldon said, that patents were to be considered as bargains between the inventors and the public, to be judged of on the principle of good faith, by making a fair disclosure of the invention, and to be construed as other bargains.

having nothing to give as a consideration for the monopoly *. A Patent, therefore, must be considered in the character of a contract between the King and the subject, by which the King concedes to him the exclusive privilege of monopoly for a number of years, in consideration of the inventor putting the Public in possession of a useful discovery which they before knew not of. But if the inventor shall be found to be incapable of putting the Public in such a situation, he cannot be considered as paying a proper price for the monopoly he asks to enjoy. For it would be a hard thing, indeed, if the Public were, upon private and individual grounds, to be placed without the pale of protection, when it possessed that knowledge which, it is to be presumed, it must by publication have acquired.

It is by no means our intention to go into an examination of the laws of Patent as they at present exist, nor, for one moment, to question their administration. We merely wish to shew that it is right and politic that protection should be given to Ingenuity generally; and this proposition being established, to see how far it would be compatible with the views of the Government to put the poor Artificer upon a footing with his wealthier brother. We disclaim all knowledge of politics—we are neither Whig nor Tory—(indeed, we are not quite sure whether we know correctly the precise meaning or construction of the terms)—but we know very many instances where the present Ministers of the Government have, with the most liberal and enlightened views, asserted and assisted the interests of impoverished but ingenious industry, and without bribing them by fair words or sleek and silky eulogies; it is upon these individuals that we feel inclined to rest our chief hope. The King of England, too, is a good and noble-minded man, full of great and generous spirit in all that hinges upon Science and the Arts—and we would, to our souls, that our poor voice could reach his ear, because then we should feel satisfied in the conviction that struggling worth would at length have hope, and something better for support.

We have thought of many and various projects in our endeavours to concoct some plan and system of relief, and it would be little difficult for us to go into a most amplified discussion of the subject. The numerous letters we have received, each hinting at peculiar and diversified views, go fully to shew us what interest is felt in the question we have raised.

It at first occurred to us, that if a body of individuals were formed for the purpose of raising among themselves a fund, out of which the expences to be incurred in securing patents for valuable discoveries should be defrayed, upon the Society being made participant in the profits to be derived, to just the extent of ultimate indemnity, and no greater, a fair prospect would then arise to the needy Artificer of remuneration for his labour; and that such individuals might be selected and appointed as were of acknowledged worth and ingenuity, and competent and fit to form a Board of Examination for the purpose of inquiring into the merits of the cases which should be laid

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* Day.

before it. But we at once saw that such a measure would be too open to attack and innovation to propose the thing as an efficient remedy.

A greatly better and far surer protection, however, soon suggested itself to our minds. We saw no earthly reason, wherefore the Government could not, with honour to itself and advantage to the Nation, and in the strictest policy, establish a means of indemnity to the poor labourer, without a sacrifice of the interest, or a prejudice to the views, of any party. The grant of a more limited time (say, for instance, two years,) during which a man should have the opportunity of realising to himself all the little profits he could amass together, would, we conceive, while altogether unproductive of evil consequences to any, be the means of generally benefiting the Community, by the disclosure of clever discoveries, and of creating a powerful stimulus to such as could not else, by any possibility, devote their faculties to the accomplishment of artificial perfection. The erection of an official Board of Invention for inspecting, examining, and determining on the merits and intrinsic value of the discoveries to be submitted to it, with full powers to award what should, upon mature deliberation, be deemed worthy of the protection of petty patent right, would be an amply sufficient recompense to those who sought its fostering influence. We do not for one moment contemplate any thing in the shape of pecuniary emolument—such a measure, we are convinced, would be fraught with little good and much danger. But we are equally fully, and as positively satisfied that the consequences to result from such an Establishment as we have alluded to would be as eminently serviceable to individual talent as it would be decidedly calculated to encourage the rise, the progress, and advancement, of Science and the Arts.

It would be premature and needless here to go into the particular details of such a measure, or the regulations which it would be wise or necessary to adopt in the establishment of such a plan—this would be altogether a matter of after-consideration, but we believe it would be no very difficult task to frame a code of regulations fully sufficient for its government without trenching upon or at all interfering with the existing system; and we most heartily and devoutly wish that the subject of the hints we have offered may be taken up and advocated by those individuals whose hearts are best disposed towards, and whose minds are best fitted to espouse, the cause of the poor but talented Artisan.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

FINE BAR IRON.—To the person who shall make the greatest quantity of bar iron, not less than ten tons, with coke, from coke pigs, equal in quality to the best imported from Sweden or Russia, and as fit for being converted into steel. The Gold Medal, or Fifty Guineas.

PREPARING BRASS.—To the person who shall discover to the Society a method of making brass from materials, the produce of Great Britain or Ireland, of superior quality to that manufactured in this country, and equal to foreign brass. The Gold Vulcan Medal, or Thirty Guineas.

MACHINE FOR RAISING WATER.—To the person who shall invent a machine, on a better, cheaper, and more simple construction than any hitherto known for raising water out of wells, &c. from a depth of not less than fifty feet. The Gold Medal, or Thirty Guineas.

RECENT PATENTS.

To RICHARD EVANS, of Bread Street, in the city of London, wholesale coffee dealer, for a method or process of roasting or preparing coffee, and other vegetable substances, with improvements in the machinery employed, such process and machinery being likewise applicable to the drying, distillation, and decomposition of other vegetable, mineral, and animal substances, together with a method of examining and regulating the process, whilst such substances are exposed to the operations before mentioned.

To JOHN HEATHCOTE, of Tiverton, Devon, lace manufacturer, for his invention of certain improvements in the method of figuring or ornamenting various descriptions or kinds of goods, manufactured from silk, flax, or cotton. Sealed 24th January. Six Months.

To ROBERT LLOYD, of the Strand, London, hatter, and JAMES ROWBOTTOM, of Blackfriars'-road, hatter, for the invention of a hat upon a new construction, said to be of great public utility. 19th Feb. Six Months.

To the Rev. MOSES ISAACS, of Houndsditch, London, for his invention of certain improvements in the construction of machinery, which, when kept in motion by any suitable power, is applicable to obviate concession, by means of preventing counteraction, and by which the friction is converted into a useful power for propelling carriages on land, vessels on water, and giving motion to other machinery. 19th Feb. Six Months.

TO OUR READERS AND CORRESPONDENTS.

We compliment A. W. A. upon his sweet little drawing; we hope to do it justice in an early number.

Edward S**th need be under no apprehension on the score of his "bad spelling and writing," though his head deserves a better *hand*, he seems to have sense at his fingers ends; we will revise and insert his remarks, which do him great credit.

A Constant Reader was not received until we had concluded our remarks on the Laws of Patent right. The great number of letters which we have received sufficiently indicate the general feeling, and we shall be most happy still to receive all the hints that can be given on the subject. Those gentlemen who have written to us, will, we are sure, forgive our not noticing them individually; from what we have heard, the matter will not, we believe, stop where it is.

Mr. Wood is pleased to afford us the benefit of his advice in the course which we should follow in a certain case; *wood*, however, is but an indifferent conductor!

"A Young Beginner" will receive our earliest attention.

Investigator's observations on the Steam Engine are too indigested for public appearance. We may do right, perhaps, to mention here, that we are now engaged in drawing up a concise history of that mighty mover, which will shortly appear.

Henry Way, we fear, is not a good way; he is altogether out of the way, or we should rather say, *in* the way; take it, however, in what way we will, his thoughts are not in *our* way.

We must take some means or other of shortly disposing of our long arrears; we have such an accumulating mass before us as is quite fearful; it may, perhaps, be by an extra number.

E. A. B. Skiagen's epistle lies before us; we think we may safely pronounce him to be a mechanic of a most extraordinary description. His letter (with curtailments) shall appear in our next.

H. R. C. R. will find an answer to his query, in our present number, on the subject of Distillation.

The Letters signed Homo, and M. D. on the same subject will appear together in our next.

[*To be continued every* Fortnight.]

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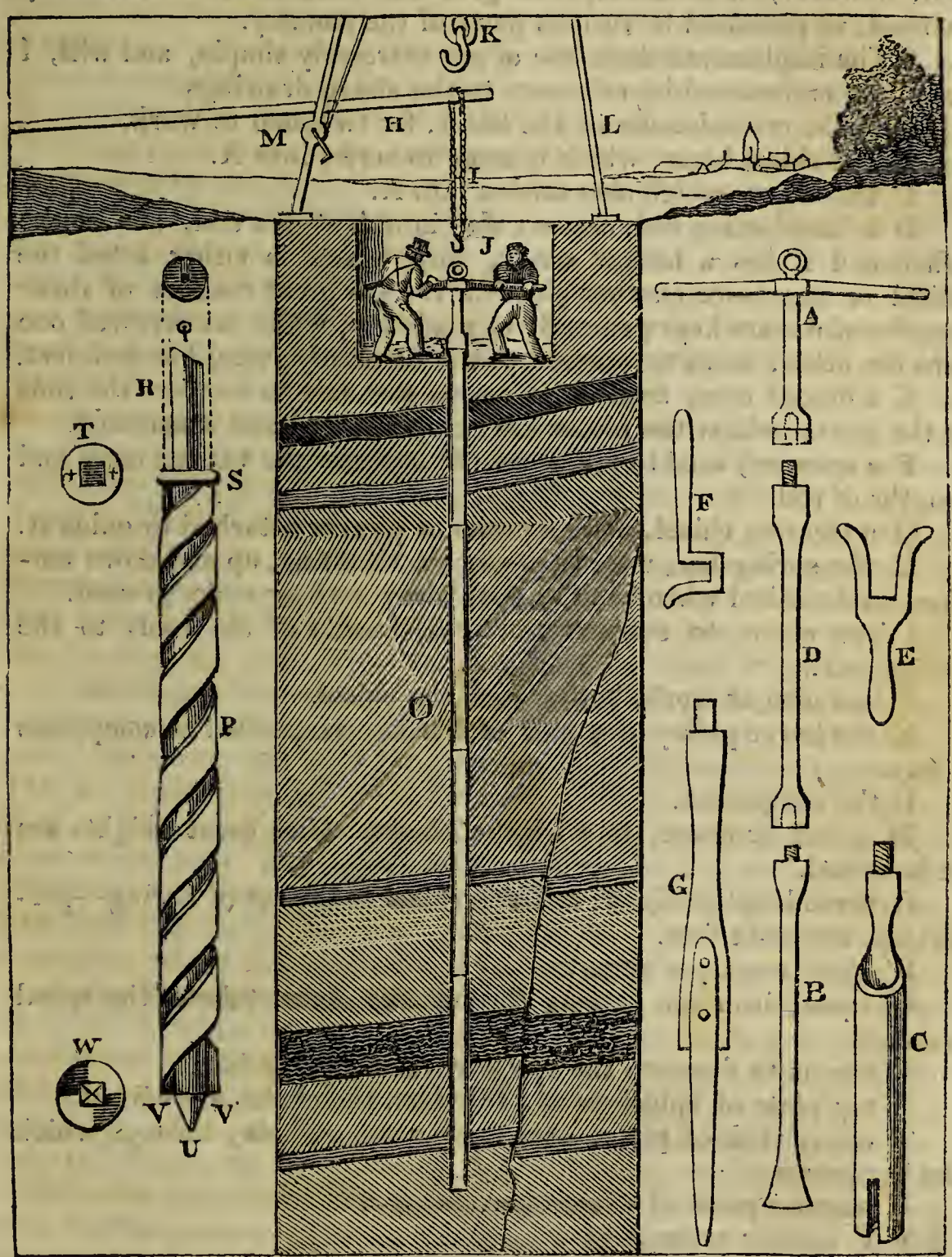
THE ARTS AND SCIENCES,

IMPROVEMENTS & DISCOVERIES.

No. 13.] SATURDAY, APRIL 3, 1824. [Price 3*d*.



ON BORING THE EARTH, FOR WATER OR MINERALS.

" To the Editor of the Register of the Arts and Sciences,

" SIR—OBSERVING, in a late Number of the Register, some inquiry relative to the manner of boring the earth for water, I take

leave to present to you such particulars of the process as I have been able to collect, accompanied with some rough drawings of the implements and the manner of using them. I should not have hazarded the probable rejection of my communication, if any talent had been requisite to describe an operation necessarily so very simple, and if I had not, in my own opinion, made some improvements therein, which appear to be calculated to save much time and labour. I will, however, first attempt to give an account of the ordinary method, as practised in various parts of the country.

"The implements made use of are extremely simple, and will, I trust, be understood by reference to the above drawings.

A is the cross-handle of the borer, for two men to work.

B the chisel borer, which is made to screw into A.

C the auger, which also screws into A.

D a lengthening rod, screws also into A at one end, and at the other end it has a hollow screw, into which is either fitted the chisel or auger—or another piece of rod; a great number of these lengths of rod are kept generally in readiness, which are screwed one into the other, so as to proceed to the depth of several hundred feet.

E a forked iron, used to lay across the hole to support the rods at the joints, whilst the pieces are being screwed and unscrewed.

F a spanner, used to screw on and unscrew the various tools and lengths of rod.

G a clearing chisel, with a probe or piercer attached to guide it.

H the spring-bar, used to produce a vibrating, up and down motion, to the chisel when used to peck away hard or rocky ground.

I iron chain, to connect the cross-handle of the tools to the spring-bar.

J two men at work, boring with the chisel.

K the lower pulley of a pair of blocks, suspended to compasses above.

L the compasses.

M winch or crane, to work the blocks, when great weights are to be raised.

O three lengths of rods and the chisel in the act of boring—perforation about 42 feet.

P spiral worm, or auger.

Q square iron bar passing through the square tube of the spiral worm.

R chains to draw up the spiral worm along the bar.

S top plate of spiral worm, to which the chains are affixed.

T upper view of plate, shewing the square hole, through which the bar passes.

U angular point of square bar.

V V cutting auger edges.

W underside view of the bottom cutting parts of the spiral auger.

"As a preparatory measure, a large circular hole is *usually* dug to the depth of seven or eight feet, at the bottom of which a floor is formed by means of some planks for the men to work, and pace

round upon, whilst using the implements.* If the earth is very soft, the only tool requisite is the auger C, of three to four inches diameter, which is screwed into the cross handle A, and the perforation is easily effected by the mere turning of it round, by two men, as shewn in the drawing. When the auger has penetrated to nearly the depth of the tube, it is withdrawn, and cleared of its contents: it is then let down again, and the perforation continued to the whole length of the instrument. To proceed to a greater depth, the lengthening rods, before described, are put into requisition. The auger is detached from the handle by unscrewing it, a piece of rod D is screwed in its place, and the auger screwed on to the rod. With the instrument thus lengthened seven or eight feet, the boring is renewed by means of the auger, as long as the earth is found to be sufficiently soft and yielding. Whenever it proves otherwise, or hard and rocky, the auger is detached from the rod, and the chisel B, which is from three to four inches in diameter at its edges, is screwed on, in its place. If the ground is not *very* hard, the boring may be continued with the chisel, by the workmen pressing upon it as they turn it round; but when the earth is too hard to be operated upon by the chisel in this way, recourse is had to *pecking*, which is done by lifting up the implement and striking it against the opposing substance till it is chipped away, or reduced to powder, to a certain depth. The rod and chisel are then again drawn up, and the auger substituted for the chisel, for the purpose of extracting the pulverised stony matter contained in the hole. The chisel and the auger are thus employed alternately, where the ground is hard and stony, the one for chipping away or pulverising, and the other for clearing out.

"As the perforation deepens, the process of pecking becomes very laborious, recourse is therefore had to a very simple contrivance, called the spring bar (see H), which affords the most effectual aid. This is a strong pole, placed horizontally over the well, at the height of three or four feet from the ground, with one end inserted into a spot or other strong hold. The chain I is attached to this bar, and the handle of the borer is suspended to the hook of the chain, which supports its weight; a slight vibrating motion is then given to the bar by the workmen, which causes the chisel to peck away with great rapidity.

"As the weight of the implements becomes too great to be drawn up by hand, when the boring has proceeded to a great depth, the mechanical aid of a pair of pulley blocks (K) is used for the purpose, which are usually suspended to a tripedal standard (or triangle as it is called), fixed over the hole. In withdrawing the rods for the purpose of bringing up the materials bored through, or for changing the tools, every piece is successively unscrewed, and upon re-introducing it into the hole, every piece is necessarily screwed on again—which renders the operation exceedingly tedious. This inconvenience, it appears to me, might be greatly lessened, by erecting a more lofty

* Instead of this, sometimes a stage is erected from ten to fourteen feet above the ground, where the men turn the boring implements, assisted by a man or two, underneath it.

standard, such as is used in shifting the masts of ships, called *compasses*; which are formed of two long mast-spars, connected together at top, with ropes passing from the summit in a cross direction to the ground (so as to form a quadrangular figure at the base,) to secure the compasses in their position. A crane, or simple winch and ratchet wheel, might then be fixed to one of the legs of the compasses at M, which should work tackle blocks, or a single wheel and axle suspended to the upper part of it; which would enable the workmen to raise a great length of rod safely, without the necessity of the almost incessant screwing and unscrewing, which occupies full three-fourths of the time and labour. Considering the compasses as preferable to the tripedal standard, I have introduced them in lieu of it, into my drawing (see L).

"In the manner described the boring proceeds, changing the tools to such as may be best suited to cut through the various strata; whether of a soft, indurated, or stony texture, until the main spring is arrived at, when the water flows up the newly formed tube to the height of the distant spring from which it is derived. If that be at a greater altitude than the surface of the earth bored, the water rises above the ground, producing a perpetual fountain; on the contrary, if it be below the surface, a well must be sunk of some capacity, down lower than the level of the adjacent spring, into which the water will flow and form a reservoir, to be drawn up by means of a pump.

"The earth is sometimes bored by the before-mentioned simple instruments, to the depth of two, three, or four hundred feet—either for the purpose of obtaining water, or to ascertain the presence of minerals. To carry on the operation at these immense depths, it is of course necessary to employ a greater power than that of the two men in the drawing; but any degree of force may evidently be obtained by lengthening the cross bar or levers, and working them above ground, as a capstan on board a ship;—or a horse may be employed to turn the boring shaft, the same as in a mill. These contrivances, however, are only my own suggestions, and must be obvious to every body.

"When the hole is bored, a pipe of cast iron, or other metal, is forced down it, to prevent its being filled up again by the falling in of the surrounding earth, and likewise to keep out the impure land springs, which might taint the water.

"Reflecting upon the excessive labour and tediousness of the ordinary method of boring the earth, I was led to consider of some means by which the operation might be carried forward at great depths, and the earth be extracted without the necessity of withdrawing the rod, and thus save full nine-tenths of the time and labour, which are occupied in the almost perpetual screwing and unscrewing of the various pieces composing its length every time it is let down or drawn up. The method by which I propose to effect this desirable object is extremely simple, and I will endeavour to describe it.

"An auger is to be made with a spiral worm, winding round a cylinder, which is to form its centre*. The cylindrical part is not to be

* This figure may perhaps be better understood by comparing it to a circular staircase, which is wound round and supported by a pillar in its centre.

solid, but perforated throughout its whole length with a square hole of two inches or more diameter, for the purpose of receiving within it an iron bar of the same figure and admeasurement. The bar will thus serve the double purpose of a spindle or shaft to work the auger, and cause it to bore; and as a slide, upon which it may be drawn up with facility, from very great depths, to the surface in a few seconds of time, its contents be discharged, and let down again, as quickly, to proceed in the perforation of a fresh portion of earth.

"It is perhaps worthy of notice, that an auger with a spiral worm is, independently of the other circumstances mentioned, much better adapted to boring the earth, than the common auger. First, because it requires less power to force the earth up the inclined plane of the spiral auger, than perpendicularly up the common auger; consequently, the latter by the application of an equal force cuts its way more slowly. Secondly, because the weight of the earthy contents in the spiral auger, lying supported on its inclined plane, adds force to the cutting, while in the common auger the perpendicular column of earth in its centre has a bearing against the edge of it, prejudicial to the cutting.

"That a part of the contents of the spiral auger may not fall out, when being drawn up, the worm or thread is not to be left open, but to have a perpendicular border, raised upwards, at right angles with the plane of the thread, as shewn in the drawing; the aperture between the upper edge of this border, and the next thread, is left open for clearing out the auger with facility; see P. The square bar, or spindle of the auger, is shewn at Q; R are the chains attached to the top plate S of the auger, and passing over a pulley wheel, are drawn up by a rope attached to the pulley. T shews an upper view of the plate of the auger, with the square hole through it. U is the angular point of the bar, which may be formed as a chisel or any other figure. V V are the side cutting edges of the auger. W is an underside view of the auger, shewing also the two under edges, which are connected with those at V V, and form right angles with them. It is evident that various kinds of tools may be fixed at the bottom of this auger so as to peck, &c.; but to go into particulars on these minor points will perhaps be tedious, and extend my letter, already I fear too lengthy for publication. I must not, however, close it without remarking, that the auger may be easily latched or bolted in its situation, should it be considered requisite, and unfastened on pulling the chains tight;—but I am of opinion, that the weight of the instrument would render the fastening of it down unnecessary; as any required force might be given by loading the upper part.

"Your constant Reader, "L. H."

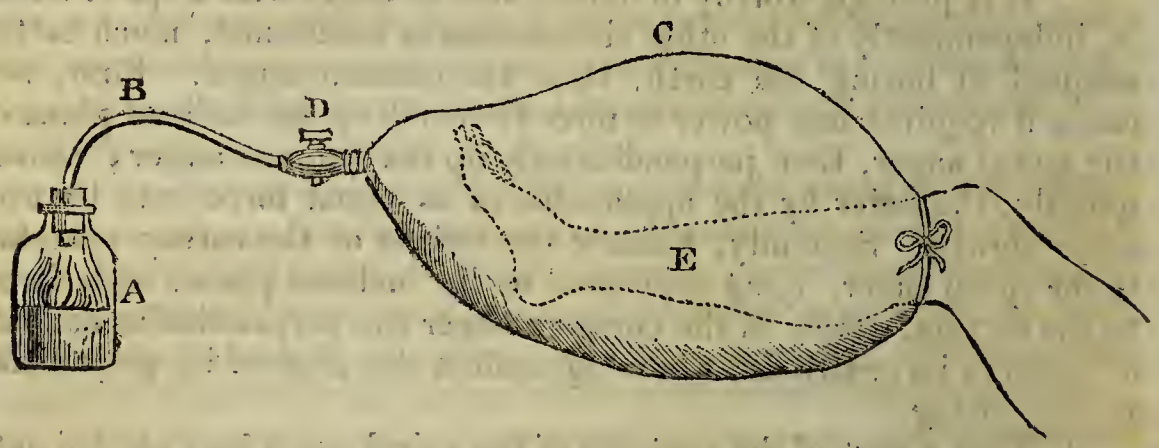
"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir,

"Observing in your last Number a few observations from Juvenis, on the striking properties of Carbon or Charcoal, and the inferences he deduces from those observations, and likewise the be-

nefits he thinks would result from the use of Carbonic Acid Gas, on its application to gangrenous sores, putrid fevers, &c. I beg leave to lay before the public, the sketch of an Apparatus, which any person or persons may apply, more particularly in the state of gangrene, with efficacy and safety, and the lingering patient restored to his wonted health and spirits.

"The simple and useful contrivance which I wish to lay before your readers, is to be constructed in the following manner :—



"A the gas bottle, in which is one part of powdered marble—one ditto muriatic acid—four ditto water ; B a flexible tube, to convey the gas into the oiled silk bag C ; D a small stop cock for the regular admission of the gas to the ulcerated leg, E. I here remark that the oiled silk bag can be made to any size or shape, and that before admitting the gas, the atmospheric air contained in the bag must be exhausted.

"In putrid fevers, I think that new yeast might be employed with advantage, by causing the patient to swallow two or three tea spoonsful of it, which, as it contains a deal of carbonic acid gas, would be likely to have the desired effect, and then in the course of four or five hours, to give a dose or two of good Peruvian bark and water.

"Having thus in a rough manner described the method *I* should use, and the way of using the apparatus, perhaps your Correspondent Juvenis will send you some of *his* ideas on the subject, which I should be happy to peruse." HOMO.

PROPOSED IMPROVEMENT IN THE PUBLIC SEWERS.

THE preservation of health must be an object of the highest interest to every body. The air we breathe is necessary to our mere *existence*, but on the purity of it depends our *health*. An eminent Physician* has said, that "*a proper attention to air and cleanliness, would do more to preserve the health of mankind than all the prescriptions of the faculty.*"

Owing to the present defective construction of the London Sewers, prodigious quantities of filth and rubbish, of every denomination, are accumulated in them ; and to such a degree at times, that the ma-

* Buchan.

sonry is incapable of withstanding the enormous pressure, and a bursting, or "blowing up," as it is called, is the consequence.

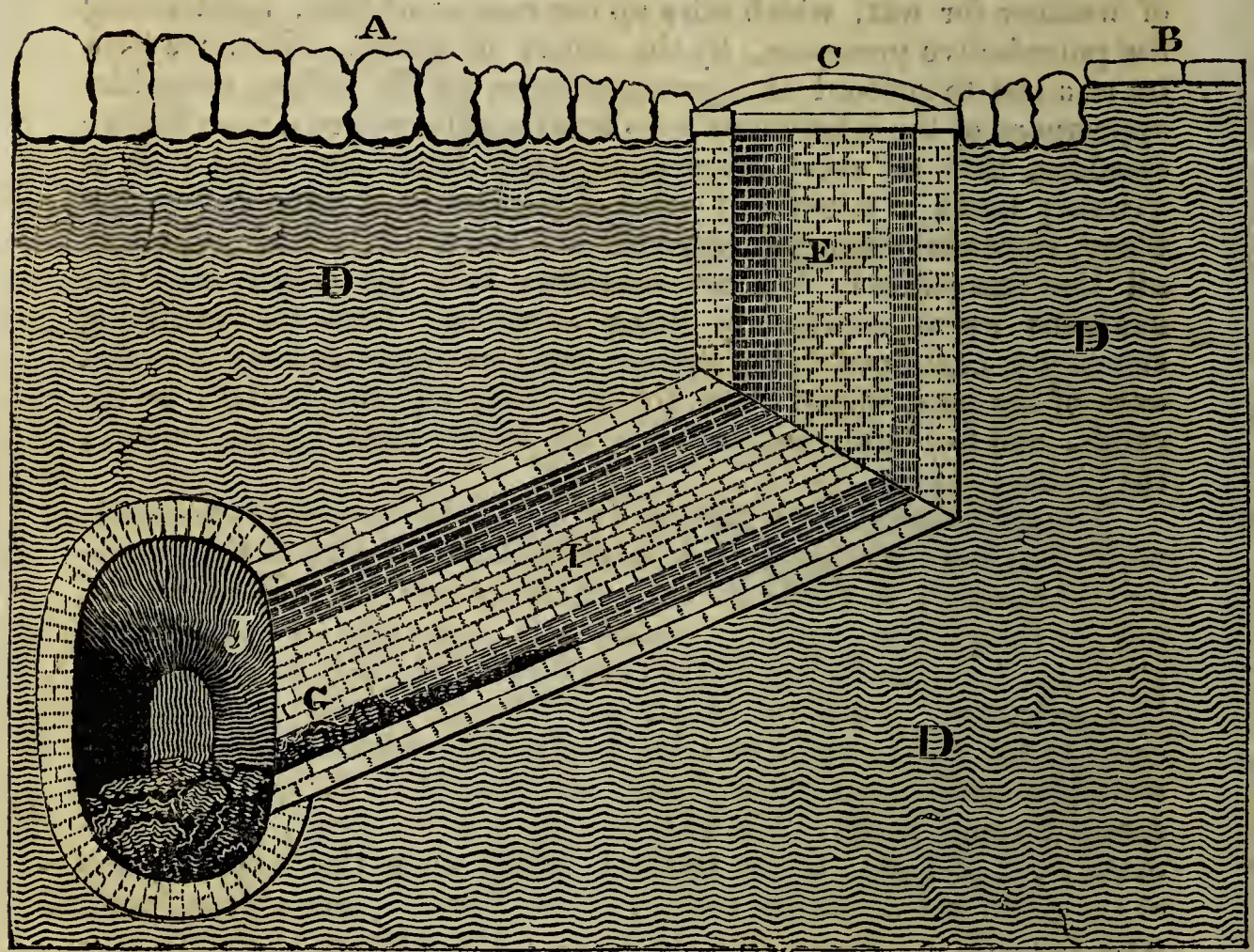
The Sewers are in fact the abode of pestilence; in them, large quantities of various animal and vegetable matter are constantly undergoing the putrefactive fermentation, which send forth their noxious exhalations, infecting and contaminating the surrounding atmosphere. In the neighbourhood of distilleries, brewhouses, and dyehouses, where large quantities of hot liquid are frequently poured off into the Sewers, the most offensive vapours arise; and in all parts of London, the same effect is produced in a greater or lesser degree by a change of weather for wet, which stirs up the masses of filth, accelerating the putrefactive processes, by the supply of water. Need we then be at a loss to account, in a great measure, for the sallow, unhealthy appearance of the inhabitants who breathe this impure air—when we consider, that at every inspiration, their lungs are filled with it (twenty times in a minute)—that a portion of it thus enters the blood, circulates through every vein and artery of the body, vitiating all the secretions? We are ourselves fully persuaded, that the nauseous gases continually being extricated from the putrifying substances contained in the Sewers, must be prejudicial to the health even of the most robust; but to the delicately constituted, to invalids, and to infants and children, the effects must be pernicious in the highest degree.

The scavengers have a practice (which we have ourselves noticed), when they have sent away their intended last cart-load of the sweepings of the day, to sweep all the remainder into the nearest Sewer, to save themselves trouble. Individuals, too, who live near to the gratings, avail themselves of the convenient and ready means afforded by the Sewers, to get rid of all their rubbish or filth; and under cover of the night, whole cart-loads of various offensive matter, from slaughter-houses and other places, are brought to the gratings, and forced through them. The matters thus thrown down, pass immediately out of sight, owing to their falling upon the inclined plane of the collateral or branch Sewer, which forms a very obtuse angle, with the well or opening into the street; the matters therefore proceed forward to the end of the branch Sewer, and fall into the main Sewer. Here a solid heap of ponderous matter is formed, which is constantly encreasing in bulk. The same effect takes place in all those parts of the main Sewers, where the collateral Sewers form a junction, till in time (the space of a year or two) the entire main Sewer is choked up, and nothing more can pass through it. Then, from necessity, is commenced an operation of a very annoying and offensive description;—the street is stopped up, the pavement removed, and the Sewer is laid open for the purpose of clearing out its foul contents: this done, the upper arching is rebuilt, the ground re-made, and the pavement laid afresh.* The cause of the first choking up of the Sewer remains unchanged, therefore the same

* The inconvenience of breaking the ground is felt a considerable time, as the paving stones are obliged to be repeatedly laid 'ere a smooth surface can be maintained.

occurrence takes place in the period of a very few years, and recourse is necessarily had to the previous disgusting operations of opening, clearing out, and rebuilding; only to be renewed again at the end of a similar period of time. The expense of these proceedings is enormous; the sum is levied upon the inhabitants by a tax, called the *Sewer-rate*, and placed in the hands of the *Commissioners of Sewers*, for their disbursement.

That the evils we have described may be perfectly understood, as necessarily resulting from an improper construction, we annex the following diagram (Fig. 1.) in elucidation.

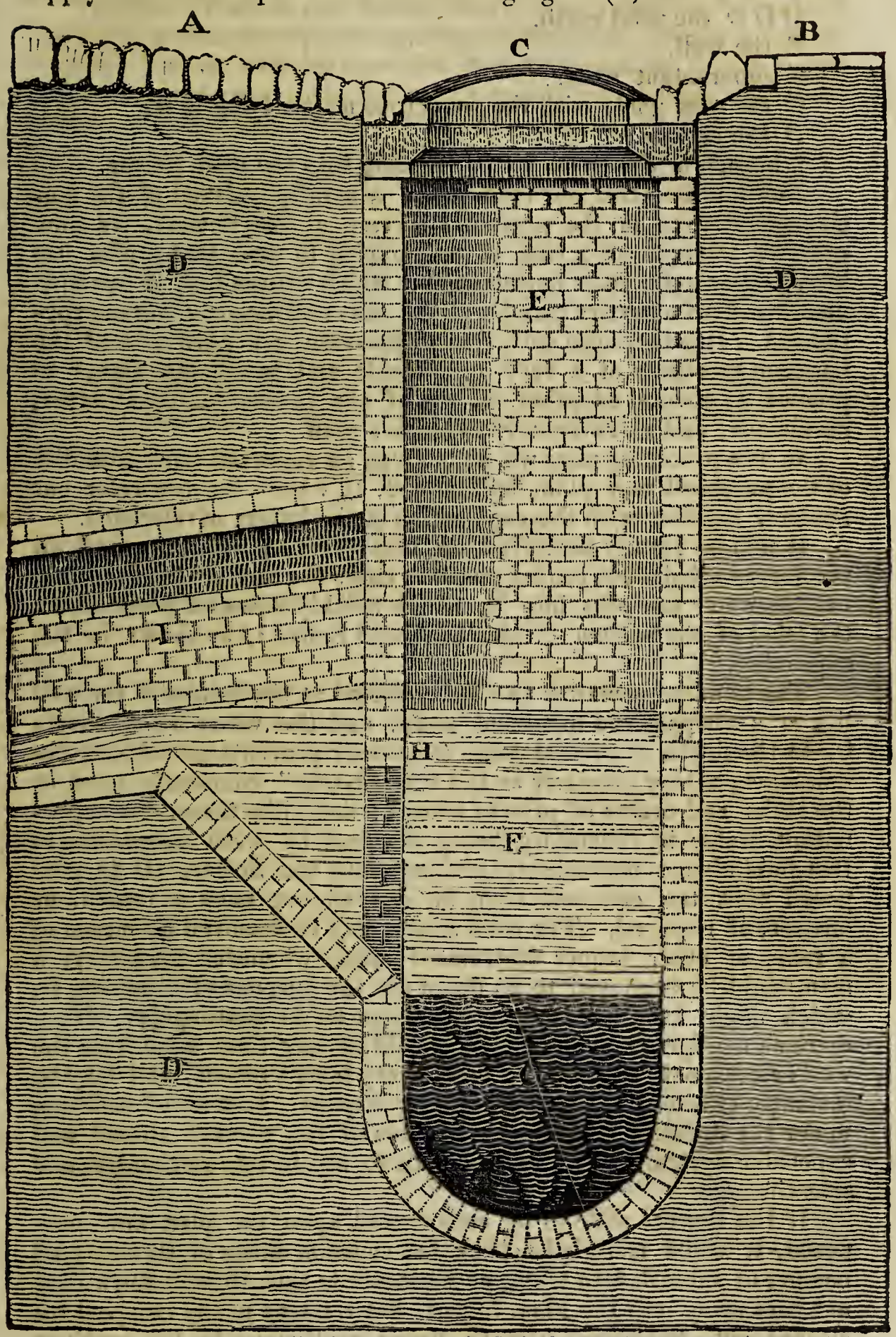


SECTION OF A COMMON SEWER,

Exhibiting the evil consequences of their present Construction.

A the paved roadway of a street.
B the paved footpath.
C the grating above ground, covering the entrance to Sewer.
D D D the solid earth.
E the well, or entrance from the street.
G a heap of ponderous matter and silt, collected in the main Sewer at the end of the collateral or branch Sewer; which continually accumulating in the main, at the junction of the collateral Sewers, is in time entirely choked up.
I the branch or collateral Sewer, leading into the main Sewer.
J the main Sewer—seen also in perspective.

N. B. The letters of reference used in the preceding diagram, apply to the same parts in the following figure (2).



Section of a Sewer upon the new and improved Construction.

A paved roadway of a street.

B paved footpath.
C the grating.
D D D the solid earth.
E the well.
F supernatant water.
G the cess pool, with the ponderous matter lying in it.
H the curtain.
I branch or collateral Sewer, leading into the main Sewer.

Not doubting that our readers are generally satisfied of the mechanical defects in the present structure of the Sewers, we now come to the agreeable task of announcing to them that a plan has been proposed for their improvement, which cannot fail, in our opinion, to afford a perfect cure for all the evils and inconveniences experienced. It is therefore with sincere pleasure, we have noticed the laudable exertions of a very respectable and intelligent man,* to procure its general adoption, in lieu of the present ill-constructed, pernicious, and extravagantly expensive plan.

In the preceding page we have given an engraved representation of the proposed new plan, by figure 2, to which we now refer our readers, together with the explanation of the letters of reference.

It will be readily perceived on inspection, that stones and all ponderous substances cannot possibly enter the Sewer—that nothing but the water can pass into it, which quickly flows off when above the level of the bottom of the collateral Sewer I, as shewn in the engraving.

The ponderous matter and silt collected at the bottom of the well lies in a compact and quiescent state, and the water which covers it, to the depth of several feet, effectually prevents all noxious exhalations; acting precisely as the "stink-trap" commonly used in the sinks and drains of private houses; and, like them, the supernatant water is constantly being changed by fresh accessions of that fluid almost unceasingly running into the Sewer. It is proposed that the cesspool shall be cleared out once a month, or oftener, if required. The solid matter may be removed by means of a rake, or other proper instrument; and, whenever necessary, a man might be employed to go down for the purpose of cleansing it, which might take ten or twenty minutes to do thoroughly. If by extreme negligence a foul smell should at any time arise from the well or cesspool, the remedy is in every body's power, and may be instantly effected, at the most trifling expense, instead of suffering under the dreadful, perpetual nuisances of the present absurd and expensive system, which is a disgrace to us, in this mechanical and scientific age.

If the Sewers were to be constructed upon the plan now proposed, it would materially check the common abuse of throwing all manner of rubbish into them, as whatever is thus thrown down does not pass away into the Main Sewer, but remains in the cesspool till cleared out; therefore, persons living contiguous to the gratings

* Joseph Cuff, Esq. of Ebenezer Terrace, London Hospital.

would not suffer others to continue their former mal-practices, nor misuse them themselves, as they might previously have done.

The Sewers are at present the resort of a prodigious quantity of rats, which come through the gratings at pleasure, and pass into the dwelling-houses. By the new plan they could not do this, which is evident on inspection; the rats would indeed no longer resort to the Sewers, as there would be no food for them; and as they could not possibly find any other such strong hold, they would rapidly fall a prey to the ensnaring arts of the rat-catcher, and their numbers be thus greatly reduced.

Feeling assured, ourselves, that *health*, *convenience*, and *economy*, would be greatly promoted by the adoption of the proposed alterations in the Sewers, we have been anxious to submit the plan to the consideration of our Readers; and we now put it forth in the firm hope that it will receive their approbation generally, and that the Gentleman before-mentioned, who has taken up the matter with such a laudable spirit, will eventually receive the support of the Public at large.

NIGHT CLOCKS.

We have received a letter from our Correspondent T. B. who interposes an apparent difficulty to our plan of night illumination. After levelling an *ironical* nine-pounder at the unhappy church-wardens, he says :—" But in very many instances (look from your window upon Bow Church, Mr. Editor,) the dial of the Clock is to be reached only by a scaffolding; how in this case would you manage to light the lamp which is to be placed behind the transparent dial ?" It was this difficulty that I had in view when I suggested that gradulated platinum would make an excellent torch for gas lamp—and I am still of opinion, that it offers an easy means of lighting lamps at great heights. I have not bestowed any attention upon the subject since it first occurred to me; but I should think it no very difficult matter to turn the stop-cock of the gas pipe, and bring the platinum in contact with the gas, by a little exertion of the art of bell-hanging. This done, the construction of the Clock, if it need any alteration, is a facile matter.—Your own, Mr. Editor, which you have so modestly produced as a " humble contrivance," could hardly be excelled in ingenuity and simplicity. The only objection seems to be, that the glass plate would require frequent cleansing. Supposing the Clocks to be lighted with gas by means of a pipe—what would our Correspondent say to an auxiliary tube running along-side it, in which escape-holes should be perforated; so that when ignition is given to the gas below, immediate inflammation runs upwards to the topmost on fire, which should lead to the burner of the Clock.

" *To the Editor of the Register of the Arts and Sciences, &c.*

" Sir,—" Men cannot fall into a greater error than build up theories, bring forward assertions, or invent discoveries, without having previously made themselves thoroughly acquainted with what has

been done in the scientific world. It is on that account that your Correspondent *Juvenis*, in the last Number of your excellent Register, has committed himself in his remarks on Charcoal. That Charcoal does effect what Juvenis asserts 'tis true; but as you very justly remarked, it must be newly prepared, and to do it effectually, it should be made from animal matter.

"It exerts those effects by its having a strong affinity for oxygen, but if left exposed to the atmosphere, it absorbs one twentieth of its weight, by which means it is rendered inactive.

"Charcoal has been long ago applied to gangrenous affections, foul ulcers, &c. with good effect, and the most skilful mode of applying it is perfectly understood, therefore Juvenis had better turn his attention to some other subject, if he means to make himself useful through your Register. Again, Pneumatic Chemistry has engaged the attention of the most eminent professional men, and every advantage derived from it which the present state of the science will admit, as your Correspondent might have learned, had he given himself the trouble to consult the periodical publications for the last twenty years. I am, Sir, yours, &c.

"*March* 8, 1824. "M. D."

N. B. The best manner of applying Charcoal is in the form of a poultice; but the application of carbonic acid gas has hitherto failed of success.

TO STAIN IVORY.

Red.—Take a quarter of a pound of the cuttings of scarlet cloth; half a pound of soft soap; let the soap be well rubbed into the cloth; then put them into an earthen vessel, and pour upon them two quarts of water; afterwards boil them for a considerable time, which will extract all the colouring matter. The cloth may then be taken from the vessel and the coloured liquor pressed out. The Ivory to be stained is now to be dipped in aqua fortis, then in cold water, and from thence into the dye whilst it is warm, which will stain it of a beautiful red.

Yellow.—Boil the Ivory in a solution of one pound of alum in two quarts of water, then immerse them for half an hour in a liquid prepared by boiling half a pound of turmeric in a gallon of water, until it be reduced to three quarts, and afterwards plunge the coloured substance into alum water.

Green.—The dye bath for this colour is best made of a solution of verdigris in aqua fortis. The process, in other respects, may be the same as that described for yellow.

Blue.—Dip the Ivory that has been made green into a hot and strong solution of pearl ashes, which will turn it to a fine blue.

Purple.—Dissolve one ounce of sal ammoniac in four ounces of aqua regia to form the dye:—prepare the ivory as in the yellow by boiling it in a solution of alum.

THE ELEMENTS OF NATURAL PHILOSOPHY,

(Continued from page 188.)

No. 9.—Hydraulics.

We promised in our last to go fully into the properties of the *Syphon*, as tending to develope several of the propositions with which we set out upon the subject of Hydraulics,* and the description adopted, will, we hope, be considered as a clear and intelligible illustration.

A Syphon is simply a bended pipe, whose legs are of unequal lengths, and is used chiefly for decanting liquors.

If a small bent tube, whose legs are of equal length, be filled with water and turned downwards, the fluid will not run off, but remain suspended therein so long as it is held exactly level; but when an inclination is given to either leg, whereby the perpendicular altitude of one is in effect made shorter than the other, the water will flow from the longest leg, and will continue to run till the vessel is emptied.

The theory of this is as follows :—The air is a fluid whose density near the surface of the earth is experimentally found to be that of water at a medium, as 1 to 850; so that 850 gallons of air near the earth weigh as much as one gallon of water. Now, as we have before stated, the air presses the surface of all things exposed to it equally in all directions. When, therefore, the legs of the Syphons (equal in length) are turned down, the weight of the atmosphere above being kept off by the machine, the under air bearing against, and repressing the water which tends to fall out of both of them with equal force, keeps it in suspense, and prevents its motion; but when by inclining it to either side, we, in effect, shorten one of its legs and lengthen the other in perpendicular altitude, the balance is destroyed and the longest will preponderate.

To observe how small an inclination will answer this purpose, one need only take a couple of jars, full of water, and hang a small Syphon, whose legs are of equal length, upon the edge of one; the external leg whereof will, from the sloping of the jar, naturally incline a little, and the Syphon will soon begin to act; then taking it on the edge of the other jar the like will immediately happen; and thus, reciprocally, the effect may be produced as often and as suddenly as you please.

It is evident, therefore, from what has been said, that when the two legs of the Syphon are of equal length, they are equally pressed by the atmosphere, and consequently no motion ensues; but when the Syphon is inclined, the perpendicular height of one is made greater than that of the other, and the weight of the water in the one overbalances that in the other, and begins to flow. On this account, in practice, one of the legs of the Syphon is made longer than the other that the effect may take place without inclining the instrument.

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* We propose to go into a similar detail of Pumps and Valves in our next.

In order to make the Syphon act, it is necessary first to fill both legs quite full of the fluid, and then the shorter leg must be placed in the vessel to be emptied. Immediately upon withdrawing the finger from the longer leg the liquor will flow. If the perpendicular height of a Syphon from the surface of the water to its bended top be more than 33 feet, it will draw no water even though the other legs were much longer, and the Syphon quite emptied of air; because the weight of a column of water 33 feet high is equal to the weight of a column of air reaching from the surface of the earth to the top of the atmosphere. Mercury may be drawn through a Syphon in the same manner as water; but then the utmost height of the Syphon must always be less than 30 inches (or rather 29½ inches, as mercury is nearly fourteen times heavier than water. The Syphon may be filled by pouring some of the fluid into it, or by placing the shorter leg in the vessel and sucking the liquor through the longer leg.

MISCELLANEOUS.

Action of Sulphur on Iron.—Colonel A. Evans has remarked that although sulphur has so strong an action on heated wrought Iron, as immediately to form holes in it, yet it does not at all affect grey cast Iron. A plate of wrought iron, 63 of an inch in thickness, heated to whiteness, and held against a roll of sulphur 6-10 of an inch in diameter, was, in fourteen seconds pierced through with a perfectly cylindrical hole. Another bar, about two inches in thickness, was pierced by the same means in fifteen seconds. Good steel was pierced even more rapidly than the iron; but a piece of grey cast iron, well scaled and heated till nearly in fusion, was not at all affected by the application of sulphur to its surface, not even a mark being left. A crucible was made of this cast iron, and some iron and sulphur put into it; on applying heat the iron and sulphur soon fused together, but the cast iron underwent no change.—*Ann. de Chim.*

Finding of Water by the Divining Rod, is said to be practised in the following manner:—A green branch of hazel or thorn is cut with a fork like the letter Y at its upper end; the water finder takes hold of the two prongs of the fork with both hands held together in front of him; keeping the Rod in an horizontal position, walking over the ground in this manner where a well is proposed to be sunk. When he comes over the spot where water is to be found, the thick end of the rod is observed to dip so decidedly, that no mistake ever arises from the indication.

Electrical Apparatus.—As the power of electrical machines is very much reduced when in a damp state, or in foggy weather, a small spirit lamp, placed under the cushion of the cylindrical, and another under the prime conductor, will increase the power in a considerable degree.

To give the Appearance of Marble to Plaister Figures.—To one ounce of Windsor soap (grated) dissolved in a glazed earthen-

ware vessel in four fluid pounds of water, add one ounce of white bees wax cut into thin slices, and when incorporated it will be fit for use. Dry the figure well before a fire, dip it into the varnish (which it will at first appear to absorb) and in two minutes time stir the compost and dip it again. Put it out of dust for a week, then rub it gently with a soft linen rag, or cotton wool, and a fine gloss will be produced. Great care, however, is necessary to be taken in this part of the process.

Domestic Economy.---It may be useful to the house-wife, who is desirous of dressing no more meat than is requisite for a meal, to know, that

4lb. Beef loses in boiling	1lb.	4lb. Mutton loses in boiling	14oz.
4lb. — loses in roasting	1lb. 5oz.	4lb. — loses in roasting	1lb. 6oz.
4lb. — loses in baking	1lb. 3oz.	4lb. — loses in baking	1lb. 4oz.

Scurvy.—A cheap and easily prepared drink has been highly commended for either preventing or curing the Scurvy, so frequently contracted at sea in long voyages. It is called Chowder Beer, and is prepared as follows: put 3½ pounds of spruce into 12 gallons of water; boil it for three hours, then take out the spruce, mix with the liquor 7lbs. of molasses, and boil it up; strain it through a sieve, and when milk warm, add to it about four spoonsful of yeast. In two or three days stop the bung of the cask; in five or six days it will be fine, and may be bottled for use. Two gallons of molasses are sufficient for a hogshead of liquor.

Preservation of Fruit.—A very ingenious method of preserving Fruit has recently been practised, by placing them into an exhausted receiver, which is produced by chemical means, instead of the mechanical aid of an air-pump.

Upon the bottom of a dry well glazed jar, are placed a stratum of pebbles, so as to cover the surface; the jar is then filled with apples or pears rubbed dry, and the fruit is then covered over with a piece of wood made to fit the jar very nicely, and upon the wood is placed a quantity of fresh mortar. Thus situated, the pebbles attract the superabundant moisture of the fruit, whilst the mortar imbibes the air contained in the jar, producing a perfect vacuum. The fruit being thus preserved from air and moisture, which are necessary to their fermentation and decomposition, may be kept in a sound state for a considerable period of time.

Preservation of Yeast.—Beat up the yeast with a whisk, until it appears thin and even; then spread it upon plates in a thin stratum, and as soon as it is dry, spread another coat over the same, and continue the operation until about half an inch in thickness, when the whole may be taken off the plates, broken into small pieces, and preserved for use in bottles, closely stopped.

A much simpler and easier mode of preserving Yeast may be adopted by the use of a screw press. Fill a canvass bag with the yeast, put it under the press, and when all the moisture is squeezed, the residue may be well packed up in paper, so as to screen it from the air and moisture.

To make Yeast expeditiously.—Boil a pound of flour with a quarter of a pound of brown sugar, and an ounce of salt, in two gallons of water, for an hour. Whilst it is luke-warm, bottle and cork it up, and in twenty-four hours it will be fit for use. A pint of this liquid is sufficient to make eighteen pounds of light bread.

MR. GURNEY'S BLOW PIPE.

Our account of Mr. Gurney's Ox-hydrogen Blow-pipe, having created considerable public attention, we have received several letters, inquiring into certain minor particulars of its construction. "A Constant Reader," and an "Original Subscriber," are informed, that Mr. Banckes, the philosophical instrument maker, in the Strand, is the manufacturer of it, and that the price is about three guineas, we believe. Those of our correspondents who are desirous to be informed of the most facile and eligible methods of preparing and mixing the gases, to be used in the instrument, we will endeavour to satisfy, by a detailed account of the process in an early subsequent number.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

BORING AND BLASTING ROCKS.—To the person who shall discover to the Society a more simple, safe, cheap, and expeditious method than any known or in use, of boring or blasting rocks in mines, shafts, wells, &c. The Gold Medal, or Thirty Guineas.

PRESERVING IRON FROM RUST.—To the person who shall invent and discover to the Society a cheap composition superior to any now in use, which shall effectually preserve wrought iron from rust. The Gold Medal, or Fifty Guineas.

PERMANENT WHITE PAINT FOR ARTISTS.—To the person who shall produce to the Society a white paint, for oil, superior to any hitherto known, and not liable to be discoloured by exposure to light or sulphuretted hydrogen gas. The Gold Medal, or Thirty Guineas.

RECENT PATENTS.

To JOHN JONES, of Leeds, for certain improvements in machinery, and instruments, for dressing woollen, cotton, linen, silk, and other cloths, or fabricks; and which improvements are also applicable to the dressing and cleansing of machinery of various descriptions, &c. 27th Jan. Six Months.

To AUGUSTUS APPLEGARTH, of Duke-street, Blackfriars, printer, for his invention of certain improvements in machines for printing. 19th Feb. Six Months.

To HENRY ADCOCK, of Summer-hill Terrace, in the parish of Birmingham, gilt toy manufacturer, for his improvement in making waistbands or spinal supporters, to be attached to coats, waistcoats, breeches, &c. to be either permanently fixed, or occasionally attached and supplied. 19th Feb. Six Months.

TO OUR READERS AND CORRESPONDENTS.

"A Constant Reader" on the subject of Illuminated Clocks will receive our earliest attention.

Tread Mill.—We regret being under the necessity of postponing until the next number, our observations in conclusion of this subject.

Mr. Carey's obliging communication on the fastening of ships came too late for insertion in the present Number, but will appear in our next.

[*To be continued every* Fortnight.]

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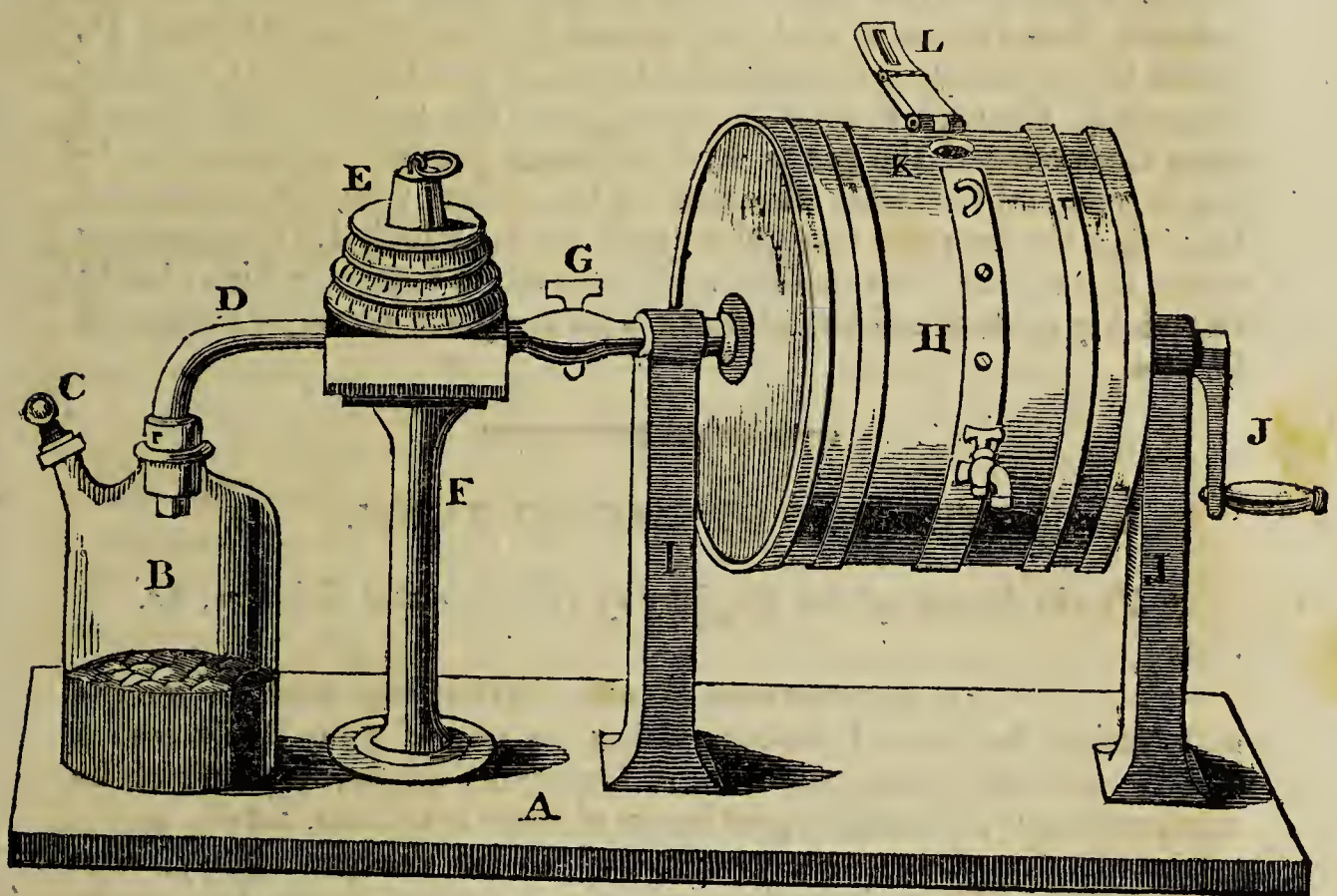


A SIMPLE AND EASILY CONSTRUCTED MACHINE

FOR IMPREGNATING WATER ON THE LARGE SCALE, WITH CARBONIC ACID GAS, COMMONLY CALLED AERATED, OR SODA WATER.

WATER may be made, by the artificial pressure of an air pump, to absorb more than twice its bulk of carbonic acid gas; producing that agreeable beverage sold in the shops under the names of *carbonated, aerated,* or *Soda Water*; but to produce the latter, there should, of course, be added a small portion of the alkali. Soda Water is a most valuable medicine in many complaints, but particularly in dispepsia, hiccup, and various disorders of the kidneys.

A is a strong plank or frame on which the vessels are fixed; B is a bottle containing a quantity of pulverised carbonate of lime, or chalk; C is the tubulure and stopper of the bottle; D a bent tube for conveying the gas into the bellows E, which are supported by the upright stand F; G is a stop cock connected with the tube D, which passes from thence into the strong iron-hooped air-tight barrel H. The barrel is suspended by its axis on the upright pillars I I.

In using this apparatus the cask is to be half filled with distilled or spring water, the bung hole K is then to be well stopped by an air-tight bung, which is to be fastened down by means of the jointed strap or hasp L being passed over the staple, and secured by a bolt or key put through the same. Then pour through the tubulure of the bottle some sulphuric acid, diluted with five or six times its weight of water, over the chalk, as before-mentioned and close the aperture C again, by the screw stopper. The carbonic acid is now extricated in the form of gas, owing to the superior affinity of the sulphuric acid for the lime. The weight being removed from the bellows, the carbonic acid gas passes therein through the tube D, which has an orifice opening under them. When the bellows are fully distended, the cock G is to be turned, and the weight being placed upon the bellows, the gas is by that means pressed downwards into the barrel, and is readily absorbed by the water, which is accelerated by giving the barrel a few quick turns by the winch J. The contents of the barrel may then be drawn off into stone bottles, which should be quickly corked and bound down with copper wire, to be preserved for use.

THE ART OF MAKING PAPER.

"To the Editor of the Register of the Arts and Sciences, &c.

"SIR,

"AN acquaintance of mine having expressed to me the satisfaction he derived from perusing, in one of your Registers, a concise account of the operation of Quarrying Stone, with which he was previously, although a gentleman of some erudition, totally unacquainted; the circumstance suggested to me the probability, that others among the readers of your Register may be equally deficient in the knowledge of an art no less worthy of our observation, and important in its results, than that above mentioned, and one, without the aid of which, even the valuable medium of intellectual accessions afforded by your Register would have no existence. You have, probably, anticipated that I mean the Art of Paper-making.

"To speak of the variety of materials and modes which different nations and ages have adopted in the production of this useful article would constitute a dissertation in every way incompatible with the nature of your Miscellany; I, therefore, beg to offer you a *short* account of the manner of manufacturing Paper, as minuted down by myself after viewing Mr. Skidmore's Paper Mill, on the river Derwent, at Matlock Bath, Derbyshire, during my visit to that delightful watering place last autumn; the insertion of which, should you esteem it worthy a place in your Register of Arts, may not prove uninteresting to some of its readers.

"The factory was, at that time, engaged in making the sort of Paper, commonly termed whity-brown; and as the mode of making this differs not in substance from that of a superior and finer texture,

a description of such mode will sufficiently exemplify the art in general.

"The constituent material of this paper consisted in old worn-out sacks, which are first chopped into small pieces by a labourer, who is for that purpose furnished with a sharp chopper and a block: the fragments thus prepared are well washed by agitating them in a vat of water, changed as often as needful: after this they are cast into the mill, which consists of a longitudinally denticulated cylinder, or roller, not much unlike the crimping roller used by a laundress for crimping frills, &c. this roller having a motion given it by a water-wheel, revolves on its axis with great velocity, within the fixed concave section of a cylinder, likewise denticulated, and fitted so closely to it, but without contact, as to grind the shreds of sacking, which are now mixed with water to a fine pulp, as they are drawn in between the two surfaces. This part of the apparatus is contained in one side or division of a trough of an oblong curvated form, with a partition in the middle, leaving it open at each end; thus forming a continuous canal in which the fluid moves round, the current which passes through the grinders being occasioned by the rapid revolution of the indented roller in the liquid. When the fibres have thus acquired a proper state of separation, the pulp is suffered to run out of the mill trough into a large receptacle, to await the next process. A sufficient portion is now transferred into another vat, where it is further diluted with water to a proper consistence, and moderately warmed by steam, circulated in pipes at the bottom of the vessel, and to prevent the pulp precipitating, the whole is kept in constant motion by an apparatus somewhat like a reel, revolving within at the lower part, and put in action also by a small water-wheel. In this state, the colour, the consistency, and the ebullition, cause it to bear a striking resemblance to a huge mess of water gruel, "thick and slab." At this vessel stands a man furnished with a frame of wire-work, very similar to what is used for meat safes, but of a closer texture, and not much unlike a four-sided shallow sieve, and of the size and form of the sheet of paper to be made; this he dips into the liquid, and on lifting it out the water drains through the wire-work, and the frame is covered with a thin layer of the pulp; the frame is then inverted on a piece of flannel, when the pulp quits the frame, and lying on the flannel resembles, and is in fact become, a sheet of wet paper: another flannel is laid on this for the next sheet. and so alternately, until the pile has accumulated to a certain quantity, when the whole is put into a powerful press, by which the water held in the material is expressed, and the paper thus brought to a state of comparative dryness. Each sheet is now taken from between the flannels, and hung across laths in the drying rooms: when dry is made up into quires, again pressed, and packed up in reams for the consumer.

"It is, I think, worthy of remark, that it is not found necessary to use any glutinous matter whatever in the above process, to give a sufficient tenacity or strength to the paper,

"Yours, &c.

"W. Y——D."

THE TREAD MILL.

(Continued from page 179 ;—the subject concluded.)

We adverted in a previous Number (12) to the various reports made upon the subject of this worthy auxiliary of the Inquisition, and we now indiscriminately select from the pages of the publication before us, a few out of the vast number of cases it contains ; undeniably proving, that the employment of treading the wheels is a baneful exercise of the body, *and to the weaker sex in particular, a most scandalous and grievous oppression.*

We take no shame to ourselves, in diverging in the present instance from our regular route, because our consciences can be little oppressed in advocating the cause of humanity. The subject, however, *is not entirely* out of our province, as the numerous casualties that are daily occurring, are the *inevitable consequences* of the *grossly absurd construction of the machinery,* in many of the prisons. At Cold Bath Fields' Prison there are twenty-four wheels, intended for 300 persons, all revolving together *upon a single axis of more than a thousand feet in length,* so that an accident occurring to any part of this gigantic engine, must necessarily cause an instantaneous derangement throughout its vast extent, and the shock be communicated to every person upon the wheels :—exposing them to the constant liability of having their bodies bruised or torn—or their limbs broken. Our readers will, we think, come to this conclusion with us, that the engineer who could construct such machinery, must have been deficient in either talent or humanity , and if punishment is to continue to be administered by means of machinery, that every wheel should be made to revolve upon a separate axis—and every means be taken, by the employment of engineers of eminence, to render the mechanism in the different prisons as little liable as possible to the accidents that are so frequently occurring.

At Cold Bath Fields' Prison, the two female superintendants of the female treaders, who. from familiarity with the discipline, must have blunted all such feelings of repugnance to administering it, as should partake of squeamish or improper sensitiveness, have uniformly, consistently, and to various persons, protested that the enforcement of it is harrowing to *their* feelings ; that *they* consider it utterly indelicate and disgraceful.—" *Most of the women complain of great debility and lassitude, and many of them cry bitterly. In warm weather faintings often occur, which precipitates the treader backwards from the wheel to the gallery floor, a height of between four and five feet : we have had a woman ordered on the wheel three times in one day, after three different faintings !*"

At a subsequent visit to Cold Bath Fields' Prison, by our author, in company with Sir John Hippesley—some further examinations took place, in the presence of Mrs. Kilby, the superintendant, who *allowed the truth of the statements ;* one of the turnkeys was also present.

" The day previous to our visit, no less than *three jerks* of

the wheel occurred. These jerks (as the superintendant and women stated) take place very frequently. When they happen, *the treaders, to save their toes from being crushed, or their legs bruised,* are obliged to *let go their hold of the hand-rail, and drop to the gallery floor,* a distance of from four to five feet from their elevation on the treadles. The jerks are so sudden, that the treaders have *no time to turn round and jump off,* but they *drop as if they were shot,* at the risk of falling forward against the wheel, or, by losing their balance in another way, backwards, on their backs or heads." Several of the female prisoners exhibited the wounds and bruises they had received from the jerks and recoils of this cruel engine. Caroline Davies was very severely hurt;—and the superintendant herself stated, that a girl, called Matilda, had her knees dreadfully lacerated from hanging on her hands, upon one of these jerking occasions, instead of dropping or jumping off backwards. "Mention was made by some of the prisoners of a man, treading at one of the corners, who fell off the wheel *through the trap-door.*" This poor fellow, it seems, *had his shoulder dislocated!* And he who was thus broken *off* the *wheel* (according to the modern improvement), was, perhaps, an untried innocent man!

"Sir John had ordered five or six prisoners, comprehending the tallest and shortest (females) present, to mount one of the wheels; they had been treading about five minutes, *when a loud noise of the machine caused us to start, and all the treaders dropped to the floor; two or three of them uttering a cry of fright, and all of them exhibiting, in their countenances, unfeigned traces of sudden and serious alarm.* The noise these jerks make is *very loud* and startling, and as if the machinery had broken abruptly in some main part."—The hands of the women had undergone the previous stage of blistering and soreness, and had become in most of them horny. The state of the hands, however, appear to be of very trifling importance, compared with the other well-attested and undeniable mischiefs of the labour; *mischiefs which the superintendants distinctly allowed to accrue,* and which were complained of in their presence, before three or four male witnesses.* The prisoners generally appeared *woefully emaciated and haggard,* and bitterly complained of the distress occasioned by the labour!!

On the 13th December another visit was made to the superintendants, when the following statements were made, among others:—"About five weeks ago a woman was sent to the Tread Mill as disorderly; Mrs. Hearn described her to be a quiet, inoffensive creature, who had never entered a prison before, and whose heart seemed broken by being sent there. About the third day of working

* These effects will not be wondered at when we inform our readers, that Dr. Good (whose name is so well suited to his character) "examined, in the presence of the Governor, the pulses of fifteen persons (nine of whom were male, and six were female) as they descended from the wheel. He found the average range of the pulse in the women to be 144, and in the men 123; thus exceeding its ordinary and healthy state in the former by 70, and in the latter by 60 beats."

she *dropped off in a fainting fit*; her fall revived her, and caused her to utter the most piercing shrieks." Several Magistrates were present at the time. "A woman of the name of Taylor, who had been at the Brixton Wheel, assured Mrs. Hearn, that at that wheel, she has seen mothers with sucking infants; that they were allowed but a very short time to suckle them; and, that if the babes cried ever so piteously while the mother was treading, she could not descend from the wheel to quiet them before her turn to be relieved came."

> "Portentous, unexampled, unexplained!
> ——————— What man seeing this,
> And having human feelings, does not blush,
> And hang his head to think himself a man?"

It will be observed, that we have only noticed *a few of the cases*, contained in the reports upon *a single prison*.—If our readers were to peruse the book now before us, entitled "*Thoughts on Prison Labour, by a Student of the Inner Temple*," they would there find a vast number of facts and cases relating to the Tread Mills in the various counties, equally demanding their attention. The sufferings of the prisoners therein detailed, especially of the poor women, are calculated to rouse the feelings of the most callous and flinty hearted.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir,

"Seeing a few designs in your valuable work on the subject of Night Clocks, I have sent you a design which occurred to me two or three years back; it is very simple, merely requiring a gas or other light with a reflector behind, to be placed so as to cast the rays of light upon the face of the Clock. In most situations the lamp would be best placed at top, or upper part of the face. Or, I would propose that the dial should be formed of glass, with black figures, and a light placed behind, with a reflector; but the former would be the most economical, and would, I think, answer every purpose.

"Should you think these remarks worthy attention, you are at liberty to make what use you please of them.

"I am, Sir, Your's truly,
"A CONSTANT READER."

"Hoxton New Town,
"March 25, 1824.

[The above communication was received, accompanied with a pretty perspective drawing on the subject; but as the plan of our Correspondent must be evident to the understanding of all our readers, we have thought it unnecessary to have it engraved.]

Aerolites.—A quantity of aerolites fell, near the village of Arenazzo, in Bologna, the beginning of last month, of immense size; some of them have been carried to Bologna, which weigh twelve pounds each. The shower of aerolites was preceded by an extraordinary peal of thunder, accompanied by a slight wind.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"THERE is scarcely a being blessed with nasal organs, but has had sensible demonstration of the existence of the whole catalogue of nuisances attendant upon the Sewers which you have enumerated in your last number, and perhaps of many more; but hardly a soul (the Honourable Commissioners not excepted) is acquainted with the cause of them: I was, therefore, well pleased to see the subject so ably exposed. The *improvement* you propose, certainly very much deserves that appellation; but may it not be possible to remove altogether the necessity of cleansing the Sewers? Suppose a flood of water admitted once or twice a week at every collateral Sewer, would not this effectually remove every obstruction, and purify the air? The flood need not be very great, for, during that short space, no great accumulation of silt could ever take place; and for the possibility of obtaining an efficient supply, I need only call your attention to the enormous pipes now laying down by the New River Company.

"I am, Sir,

"Your most obedient,

"*April* 5, 1824. "CLOACINUS."

[If the gross contents of the Sewers consisted merely of silt, the plan of Cloacinus for cleansing them might prove effectual; but the mineral and other ponderous matters that are constantly finding their way into the main Sewers, would, we think, soon establish a barrier, capable of withstanding the force of a greater volume of water than could possibly be spared by the New River Company. From a rough and hasty calculation which we have just made, it appears to us, that as much water from the clouds is sometimes showered down upon the streets of London in a single day, as is contained in the whole of the New River from London to Ware; and we know too well, from experience, that the heaviest rain is sometimes insufficient to remove the obstacles in the main Sewers; notwithstanding the simultaneous rush of vast torrents of water into them from every collateral Sewer.]

ON COPPERING SHIPS.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"OBSERVING that one of my ships, after being coppered on the blocks in a dry dock, when floated out of the docks, that her copper under the buttocks, for a considerable way forward, and on the luff of the bows, for a great way aft, became wrinkled or puckered a great deal; as it appeared very unsightly to the eye, and also, as the raised parts of the copper, meeting with resistance, would soon wear the copper through, I gave the ship a careen, took the copper

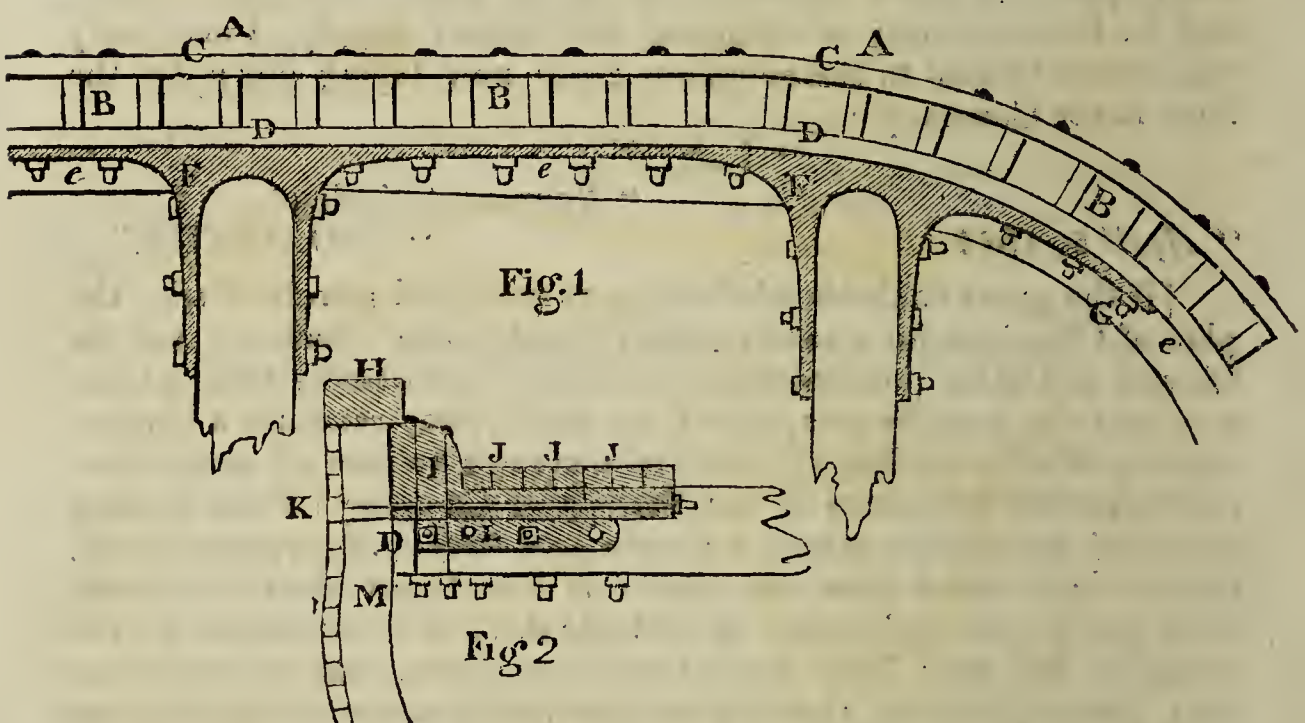
off carefully, had it beat smooth, and put on again. The consequence was, the copper remained smooth ever after, until I new coppered her again.

"I find that all ships drop forward and aft more or less, according to their strength, when first launched off the stocks, or floated from a straight block, in a dry dock. I therefore now determined to sheath my ship up no higher than light water-mark, while in dock, on straight blocks, and, in two or three days after the ship had settled, to finish the coppering. I did so, and had the satisfaction to see my copper continue smooth to the last.—If the inclosed information will be worth your Readers' notice, I beg you will give it a place in your much-esteemed Work, for the benefit of merchants and ship-owners.

"Your's, &c.

"EDWARD CAREY,

"Inspecting Shipwright and Surveyor of Shipping, Bristol."



"MR. E. CAREY'S METHOD OF FASTENING A SHIP'S SIDE WITH HIS NEWLY-INVENTED IRON KNEES.

"Fig. 1 is a horizontal section of a portion of a ship's side and beams.

"A A shows the ship's side—B B B the timbers—C C the thickness of the outside planking—D D a plank, 3½ inches thick, which goes all round the ship, inside the timbers, against which the iron knees are fixed, and bolted through the side—*e e e* an horizontal clamp, 10 inches wide, and 6 inches thick—F F the iron knees, 4 inches wide and 2 inches thick, which are bolted through the beams and ship's side, as at G G.

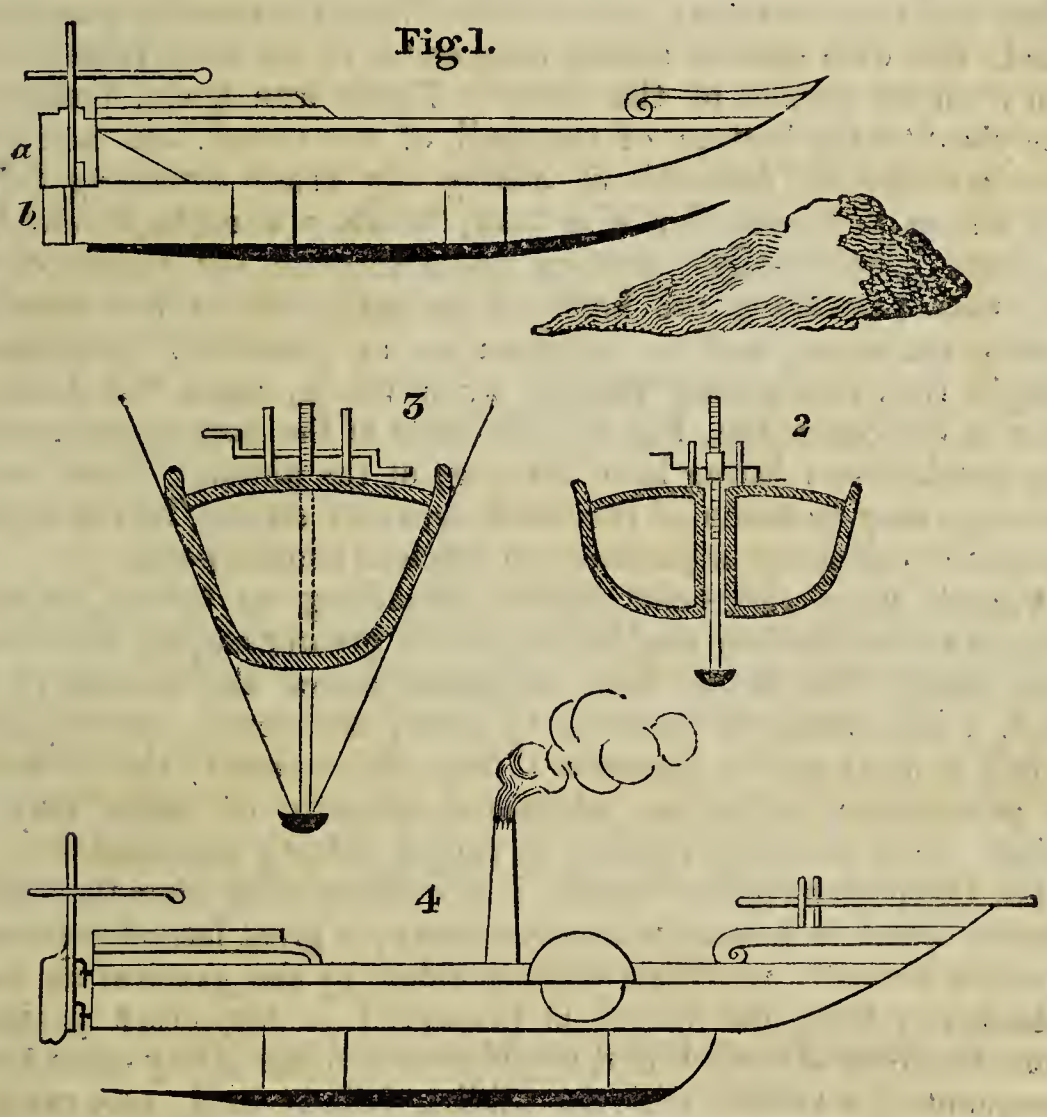
"Fig. 2 is a vertical section of the same parts as fig. 1.

"H is the plank-sheer—I the water-way—J J J the ends of the planks—K a bolt that goes through the ship's side, through the edge of the water-way, and six streaks of the deck, below the beam, and is clenched on an iron plate on the inner plank—L arm of the knee—

M the ship's timber and side.—D is an edge view of the inner plank, as shewn at D, fig. 1."

"The above is a rough sketch of my new-invented Iron Knee and Water-ways, which are let down upon the beam 3 inches, and also six of the deck planks, and bolted through all; under the beam a plank 3½ inches thick is first brought on, inside the ship, against which the ends of the beam are fixed. The horizontal clamp, 10 inches wide and 6 thick, is then brought on under the edge of the plank, and bolted through the side. On this clamp the beam is dove-tailed in one inch down, and bolted through the end of the beam. A ship fastened in this way will render it impossible for the side to move; consequently no wet can possibly get down, and the ship must be kept perfectly dry and sound."

Fig. 1.



THE PATENT ACCELERATING IMPROVEMENTS IN NAVAL ARCHITECTURE,

By Moncrieffe Willoughby, Esq.

The object of the Inventions which form the subject of the above cuts is to accelerate the velocity of sailing vessels through the water, by enabling them to spread a greater surface of sail to the wind,

without increasing their liability of being overturned in consequence. The proposed improvements likewise enable them to sail in much shallower water, and over shoals and banks that would be altogether impossible in vessels of the ordinary construction.

It is necessary to deposit in all sailing vessels a quantity of heavy material, called ballast, to preserve them in their erect position in the water; and it is well known (indeed self-evident), that the lower the ballast is placed in the hull, the steadier the vessel will sail; acting precisely as the lever, when the force which is requisite to move a weight, placed at a given distance from the fulcrum, becomes inadequate for that purpose upon the weight being placed at a greater distance. Guided by this immutable law of nature, Mr. Willoughby has succeeded in constructing a very simple and ingenious apparatus, admirably adapted to effect the important objects he had in view.

It consists in the adaptation of a moveable or sliding keel, made of iron and very massive; which by its weight serves the purpose of ballast, and with greater effect, on account of its more remote situation from the surface of the water. These iron keels, instead of being *fixed* to the bottom of the hull of the vessel, are made (as before-mentioned) *moveable or sliding*—by firmly attaching to the keels strong perpendicular iron bars, which are made to slide up and down in water-tight grooves made through the centre of the hull; thus permitting the keels to be projected to any required depth in the water, and to be drawn up at pleasure; by means of a simple rack and pinion worked by a winch, upon the deck, as shewn in the engraving, Fig. 2: the ends of the bars of suspension being notched and fitting into the cogs of the pinion. Thus every advantage may be taken of the wind, however strong, by the facility afforded of obtaining at pleasure an efficient counterpoise.

Vessels upon this construction, requiring no ballast in their hulls, are consequently enabled to stow a greater cargo; and owing to the heavy keel being thus suspended below the bottom of the vessel, a less weight is required to steady the vessel, consequently her hull is less sunk in the water; from which result, the choice of two advantages, either an additional quantity of cargo may be carried, or an increased rapidity of sailing thereby obtained.

For the reasons before stated, it is evident, that when the ballast keel of a vessel so formed is lowered down, a great lateral resistance is thereby created, which powerfully aided by the gravitating force of the heavy keel, the vessel is preserved in her erect position, against the force of a wind, that would overturn one of any other form; consequently, a vessel, with the sliding ballast keel, may carry in perfect safety a vastly greater extent of canvas or sail, than other vessels; and the rapidity of her sailing accelerated in the same proportion, beyond all others.

[As we have much more to add upon this interesting invention, and very little space unoccupied in the present number, we are under the necessity of postponing the continuation of the subject till our next, when it will be concluded.]

IMPROVEMENT IN PLATE, ELECTRICAL MACHINES, AND LEYDEN JARS.

M. Metzger, of Sibligen, in Schaffhausen, has made, it would seem, a great improvement in Plate Electrical Machines. As the effect is usually obtained by first exciting the glass in a great degree, and then collecting the electrical fluid, M. Metzger was of opinion that the effect was considerably lessened by the distance between the rubber and the points of the conductor, in machines of the usual construction, which not only caused a loss of a part of the electricity, but a waste of the exciting surface. He therefore mounted his plates with three pair of rubbers to each, which were fixed at equal distances, in the exactest and nicest manner; and the electricity was collected in the usual way, by means of points at the ends of three arms, branching from the conductor, each set of points being placed a little before each pair of rubbers. The rubbers were not, as usual, fixed to the wooden frame, but to brass arms, connected with the cylinder in which the axis revolves, diverging from each other towards the periphery of the plate. The apparatus is compact and elegant, and its minute parts are executed with much propriety and exactness. In several comparative experiments, with a plate 22 inches in diameter, the results manifested a great superiority of three pair of cushions or rubbers over two. By the following Table is shewn the increase of power derived.

Length of the Rubbers.	Length of Spark when two pair of Rubbers were used.	Length of Spark when three pair of Rubbers were used.
6 Inches.	12 Inches.	18 Inches.
7	14	21 .....
8	16	24 .....
9	18	27 .....
10	20	30 .....

M. Metzger has likewise made some improvement in the Leyden jar, so as to encrease their capacity, without augmenting apparently their volume. This he effects by simply placing two jars, of suitable dimensions, one within the other, fitting so far as to be in contact, by which means he obtains a capacity in proportion to the coated surface of both jars, within the space of the largest. Jars made rather conical in their figure are best adapted for this arrangement.

BIB. UNI.

THE ELEMENTS OF NATURAL PHILOSOPHY,

No. 10.—Hydraulics.

[*Continued from No.* 13, *page* 206.]

Pumps.—Of all hydraulic engines, the Pump is the most useful, and most common. The discovery of it is attributed to Aesibius, a learned mathematician, of Alexandria, about 120 years before the Christian Era. The improvements upon it became general and progressive, when the pressure of air came afterwards to be known; and it has now arrived to a great degree of perfection.

Of this machine there are three kinds—
The Sucking Pump.
The Lifting Pump.
And the Forcing Pump.

By the two last, water may be raised to any height, with an adequate and sufficient power. By the Sucking Pump it can only be raised 33 feet from the surface of the water, because a column of water of that height is equivalent to the weight of the atmosphere. In practice, this kind of pump is seldom applied to raising water above 28 feet, as it is known, from the variations observed on the barometer, that the air is sometimes lighter; and, whenever this was the case, the pump would fail in its office.

The following description of these pumps will, perhaps, give a tolerably correct idea of their nature and operations.

The Sucking Pump is an engine both pneumatic and hydraulic. It consists of a pipe open at both ends, in which is a moveable cylinder, or piston, as big as the bore of the pipe, in that part wherein it works; and contrived, by leathers, or other means, to fit the bore exactly, so as not to allow any air to get between it and the sides of the pipe where it acts. In the piston of the common Sucking Pump there is a valve opening upwards, like a trap-door, to allow the air and water freely to ascend through it, but to prevent either of those fluids from descending. This piston is called the *bucket.* It is moved up and down in the pipe by a rod fastened to a handle, or lever, or such parts of machinery as are intended to work it. The pipe usually consists of two parts, of which the wider one is called the *working barrel,* to contain the piston; and the smaller, the *suction-pipe.*

At the junction of the working barrel and suction-pipe there is a valve opening upwards. The lower end of the suction-pipe is immersed in water, (admitted to it through small holes, in order to prevent the entrance of dirt), and at the top of the working barrel is a wide head and pipe, for the delivery of the water to be raised.

Now, if the piston be close down upon the fixed valve, (both valves remaining shut, by their own weight,) and the bucket be drawn upwards, it is evident, that, as it fits the pipe exactly, a vacuum will be formed; consequently the air in the rest of the pipe, under the piston, will open the fixed valve, and fill the part which had thus been exhausted; but it will be rendered rarer than before, consequently, its spring not being equivalent to the pressure of the atmosphere upon the water in which the pump is immersed, the water will therefore be forced up into the suction pipe, until the air within be as dense as before, and then it will stop. Upon depressing the piston a second time, the same effect is repeated, until at last the water lifts the valve, and comes into the barrel. When the piston now descends, it is forced through the water, which cannot be pushed down through the valve, because it opens upwards only. The water, therefore, gets above the piston, by passing through its valve, and when it is next raised, all the water above it must be lifted up and run off by the pipe or mouth of the pump. Thus, by alternately raising and depressing the piston, the effect is produced.

If at the beginning of the operation the leathers be dry, the piston will not sufficiently exhaust the air, and the water will not rise. This difficulty is however obviated, by pouring in a little water, which tends to swell the leathers, and causes them to fit more closely. This is commonly called *fetching* the water.

The *Lifting Pump* consists of a body or barrel, with narrow apertures at the lower end, to prevent the entrance of dirt, stones, &c. At this lower end is a valve, opening upwards, which, while it prevents the water from returning downwards, allows it to pass through. In the barrel is a perforated piston, having on it another valve, also opening upwards. This piston is moved up and down by a rod, worked by a lever, or other machine. Both the piston and lower valve must be under the water in the well. When the piston is pushed down, the water below it not being able to go downwards, on account of the first valve, raises the valve of the piston, and gets above it, and when the piston is drawn up it of course lifts the water on it, while the pressure of the atmosphere causes more water to supply its place, by lifting the first valve. In this manner, by successive motions of the piston, the water is at last got to the top, and discharged by the spout of the Pump. In this Pump there is always a column of water lifted, whose base is equal to the top of the piston, and whose height is equal to the distance from the piston to the head. It is evident that this weight will not be made less by diminishing the diameter of the barrel above the piston, because, as it has been before stated, fluids press in proportion to their bases and perpendicular altitudes. This Pump is the most simple of all in its operations, and is much used in great water-works.

We shall continue this subject in our next, and proceed to describe the nature of the *Forcing Pump;* although it is difficult to give a clear idea of these machines without the assistance of illustrative engravings, we trust that the above will be found sufficiently intelligible to convey an accurate knowledge of their properties.

SCIENTIFIC & MISCELLANEOUS INTELLIGENCE.

Muriatic Acid* existing in a free state in the Human Stomach.—The proofs of this astonishing fact have been laid before the Royal Society by Dr. Prout. The contents of a stomach were digested in distilled water, and the solution divided into four equal parts. One of these being evaporated to dryness, and burnt and examined in the usual way, gave the quantity of muriatic acid in combination with fixed basis. A second was saturated with an alkali, and upon being treated in a similar way gave the whole quantity of muriatic acid in the stomach. A third being carefully neutralized with a known solution of alkali, gave the quantity of free acid; and the fourth was reserved for future experiment.

* Spirits of Salts.

In this way, Dr. Prout ascertained that the unsaturated muriatic acid in the stomach was always considerable; in one instance the Dr. procured, from twenty ounces of a fluid from a very deranged stomach, more than half a drachm of muriatic acid of specific gravity 1-160.

Sulphate of Copper* successfully administered in Cases of Croup.—Dr. H. Hoffman recommends the Sulphate of Copper as an excellent remedy in Croup, especially after blood-letting, In slight cases he begins with only from a quarter to half a grain every two hours; in those cases, where there is also laryngites, or bronchites, three, four, or five grains are administered, so as to excite instant vomiting; by so doing, the Dr. thinks that not only is the lymph expelled from the trachea, but also that the further secretion of it is prevented, so that the patient is much relieved and soon cured. After copious vomiting has been produced, the medicine is to be given in small doses, in conjunction with digitalis. In support of the utility of this practice, Dr. H. affirms that he has employed it with great success during a period of ten years, in a vast number of children affected with Croup, without losing a single patient in all that time, notwithstanding the disease was often at its height when he was called in.—*Med. Repos.*

Preparation of Kermes Mineral.—M. Fabroni states that a much finer Kermes Mineral may be obtained by employing tartar in lieu of the alkali, in the usual process. Three or four parts of the tartar are to be mixed with one part of powdered sulphuret of antimony, and exposed to a red heat, in a crucible, until the entire decomposition of the tartar is indicated by the cessation of fumes; the mass should then be dissolved in warm water, be filtered, and left to cool; when an abundance of very fine deep-coloured kermes will be deposited on the bottom of the vessel. This abundance of the kermes is not, however, attended with any diminution of the quantity, or brilliancy of the golden sulphuret, subsequently obtained by the addition of acid to the mother liquor.—*Annales de Chimei.*

Composition of White Copper.—According to M. Keferstein, a white metallic composition, like silver, has been employed for a long time past at Suhl, in ornamenting fire arms, &c. M. Brandes has found it, by analysis, to be an alloy of copper and nickel. M. Kerferstein and Muller, in seeking for the origin of this substance, ascertained that it was derived from the scoria of some ancient copper founderies, that were formerly attached to the mines, long since abandoned. Thus the white copper, formerly rejected as useless, is now obtained by fusing the scoria for the purposes abovementioned.—*Annale de Chim.*

Extraordinary Removal of a large Tract of Land.—On the 28th of August, 1823, the inhabitants of the village of Hayotte, in the parish of Champlain, Canada, were alarmed by the movement of a large tract of land, measuring a superficies of 207 arpents. It moved from a distance of five or six arpents (about 360 yards)

* Blue Vitriol.

from the water's edge, and precipitated into the river Champlain, overwhelming, in its progress, barns, houses, trees, &c. In an instant the river was dammed up for the space of twenty-six arpents, producing an awful sound, and a dense vapour as of pitch and sulphur. Various causes have been assigned for the phenomenon, of which the most probable is the insinuation of water between the strata.

Indoor Sun Dials.—Mr. Marraud, a Professor of Languages, in London, has invented a peculiar kind of Sun Dial, which is only used in doors. It is made on a plate of glass, and set in a frame similar to a picture. The adjustment is simply to hang it upon a peg fixed in the sash of the window, the back of the Dial against the pane of glass; when the hour is shewn by a luminous speck, which is made to traverse a plate of enamelled glass, intersected by lines forming angles calculated to the latitude of the place, and its declination east or west of the meridian. This instrument forms at once an ornament for a parlour or drawing-room, and a most accurate Sun Dial. It might also be fixed in the sash of the library window, or any other, where the stopping of a pane of glass would be of no consequence.

Female Clothes taking Fire.—It is a common and pernicious error, to tear the clothes off a person immediately after the fire has been extinguished; if the skin which covers the blisters under the clothes becomes broken or torn off by that injudicious proceeding, the most inverterate sores and wounds are thereby produced. Vinegar thrown copiously over the clothes is the best application, but if this cannot be had at the instant, water or beer may be used until vinegar is procured. If the burning is very serious, continue the copious application of fresh vinegar for two or three hours, which will generally prevent any ill consequences. Great care should be taken not to break the blisters, which is of the utmost importance in effecting a cure.

The Green Colour of Vegetables.—If the seeds of vegetables be sown in a dark place, they will produce their kind, but without colour. If we cover down any sort of plants, they will be deprived of their beautiful green, which appears to enter at the tips, and to be imbibed from the atmospheric air.

During the winter spent by Captain Parry and his crew in the arctic regions, they grew small sallad by means of woollens, in which the seeds were sown, and placed near to the fire-place; but owing to the severity of the climate they were compelled to batten down and caulk every crevice in their abiding place, the vegetables came up quite white; and when the season became milder, so as to permit the removal of a board or two, the tips of the sallad were seen to bend that way, their upper extremities first turned green, and crept gradually towards the roots. Thus the vigour as well as the colour of plants reside in the atmosphere.

Apple Bread.—A very light, pleasant bread is made in France by a mixture of apples and flour, in the proportion of one of

the former to two of the latter. The usual quantity of yeast is employed as in making common bread, and is beat up with flour and warm pulp of the apples after they have been boiled, and the dough is then considered as set; it is then put in a proper vessel, and allowed to rise for eight or twelve hours, and then baked in long loaves. Very little water is requisite; none, generally, if the apples are very fresh.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

SUBSTITUTE FOR LEAD PIPES.—To the person who shall invent and produce to the Society a substitute for the lead pipes used for conveying malt and other liquors from the cellars to the bars of public-houses, superior to any other metal pipes now in use, and at a moderate expence, &c. The Gold Medal, or Fifty Guineas.

ULTRAMARINE.—To the person who shall prepare an artificial ultramarine, equal in colour, brilliancy, and durability, to the best prepared from lapis lazuli, and which may be afforded at a cheaper rate. The Gold Medal, or Thirty Guineas.

DESTROYING THE FLY ON TURNIPS.—To the person who shall discover to the Society an easy and efficacious method of destroying the fly on turnips, or of preventing its injurious effect on the crop. The Gold Medal.

RAISING THE BODIES OF PERSONS WHO HAVE SUNK UNDER WATER.—To the person who shall invent and produce to the Society a cheap and portable drag, or other machine, superior to those now in use, for the purpose of taking up, in the best and most expeditious manner, and with the least injury, the bodies of persons who have sunk under water, The Gold Medal, or Thirty Guineas.

RECENT PATENTS.

To WILLIAM YELTS, of Great Yarmouth, in the county of Norfolk, merchant and shipowner, for his invention of certain apparatus to be applied to a windlass. Sealed 28th Feb. Two Months.

To JEAN JAQUES STAINMARE, of Belmont Distillery, Wandsworth-road, Vauxhall, in the parish of St. Mary, Lambeth, distiller, in consequence of communications made to him by certain foreigners residing abroad, and discoveries by himself; for the invention of improvements in the process of an apparatus for distilling. 20th March. Six Months.

To JOEL SPILLER, of Chelsea, in the county of Middlesex, engineer, for his invention of an improvement or improvements, in the machinery to be employed in the working of pumps. 6th March. Four Months.

TO OUR READERS AND CORRESPONDENTS.

On account of the approaching holidays, our present Number was in the Press much earlier than usual, and the several communications received on the 13th and 14th ult. are necessarily postponed insertion.

We thank "D. M." for his useful information, who is of course not aware that a portion of it has already appeared in some of our recent Numbers. We will give the subjects our earliest attention.

Our dear friend Skiager's Revolving Umbrella we have sought for in vain. From its close resemblance to a parachute, we strongly suspect it has ascended among the clouds, for no where on earth can we find it. We hope, that the next time he favours us with any thing from the excellent workshop of his brain, he will have the goodness to introduce a little *more ballast* in it.

We thank "W. Y." for his valuable communication.

The brilliant wit contained in H. H.'s "Dissertation" makes us exceedingly regret that it contains no useful or real information which would have enabled us to lay it before our Readers.

[*To be continued every* FORTNIGHT.]

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Fig. 1.

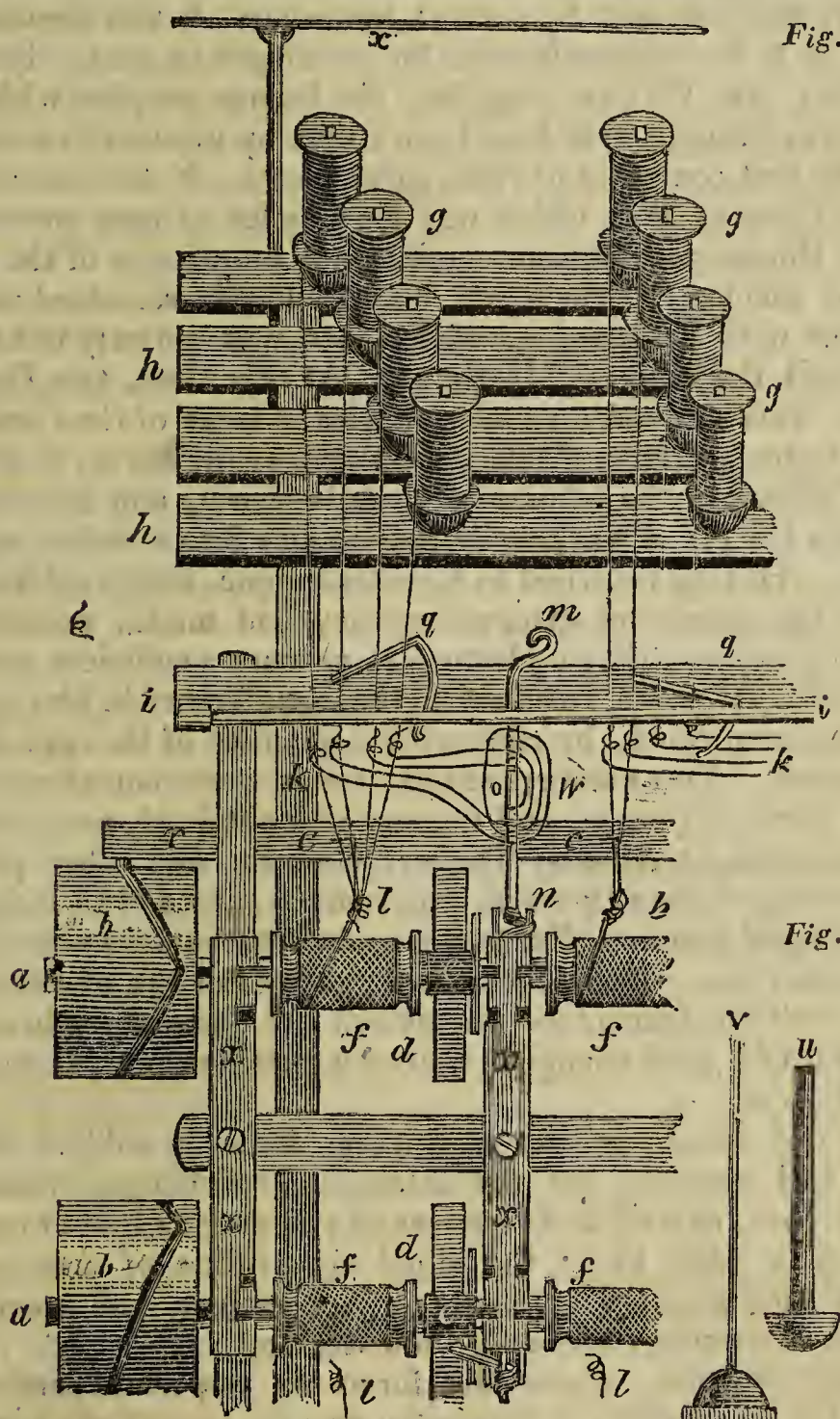
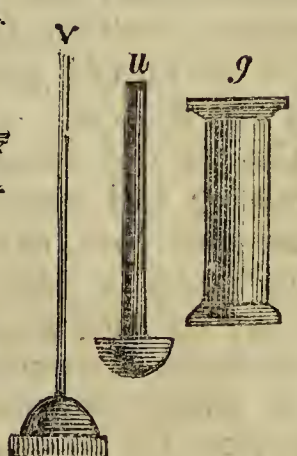


Fig. 2.



MR. SHENTON'S IMPROVED ENGINE FOR TRAMMING SILK.

PRIOR to entering upon a description of the above highly ingenious machine, a slight historical sketch of the origin and progress of the

manufacture of Silk, will, probably, prove acceptable to many of our readers.

The silk worm is a native of China, and the culture of Silk in ancient times, was entirely confined to that country; where, we are told, that the empresses, surrounded by their women, employed their leisure hours in the rearing of silk, and in the weaving of silk tissues and veils. From China this valuable commodity was first conveyed into Persia; after the conquest of that empire by Alexander the Great, it was brought into Greece; from thence it was carried to Rome, where, as we are informed by several historians, it was deemed of such value, as to be commonly sold for its weight in gold. For several centuries, the Persians supplied the Roman empire with the silk, which was brought over land from China by means of caravans, traversing the vast continent of Asia, in 243 days. Notwithstanding, an immense trade in *silk*, which was for a series of ages carried on between the Roman and Persian empires, the knowledge of the silk-*worm*, or the manner in which silk was produced, remained an important secret with the eastern nations; and was entirely unknown in Europe until the reign of Justinian. At this time, two Persian monks, who were employed as missionaries in some of the Christian churches in India, penetrated into the country of the Seres, or China, where they observed the labours of the silk-worm, and became acquainted with the art of working its productions into a variety of elegant fabrics. Having returned to Constantinople, they explained to the emperor the important discoveries they had made; encouraged by his liberal promises, they undertook to procure a sufficient number of these wonderful insects, to establish the manufacture in his capital; which they accomplished, by conveying a quantity of the eggs in the hollow of a cane. Vast numbers of silk-worms were soon after reared in different parts of Greece, and the raw silk obtained, was wrought into manufactures at Athens, Thebes, Corinth, and other places; and the breeding of the silk-worm was rapidly extended to Italy and Sicily, with equal success. Extensive manufactures were established in many of the towns of these kingdoms, with the silk of their own production; and the demand for the eastern silk diminishing in consequence, produced a great change in the commercial intercourse between India and Europe.

The natural history of the silk worm forms a subject highly interesting and curious; but the extraordinary changes which the animal undergoes, as well as its manner of spinning its ball or cocoon, having probably fallen under the actual observation of most of our readers, we shall pass over this part of our subject, and proceed to the business of winding, throwing, and weaving.

In those countries, where silk forms an important article of commerce, the cultivators, or those who rear the insects, do not wind off the silk from the cocoons themselves, but sell them to others, who make the operation of reeling a distinct business. The single filament, or thread of silk, as produced by the worm, is of such extreme tenuity, as to be totally unfit for the purposes of the manufacturer. Therefore, in winding it off, several of the cocoons are immersed in

warm water (to soften the gum with which the silk is naturally connected,) their several ends are then joined and reeled off together; and, by the adhesiveness of the gum, are thus formed into one smooth, even thread. When the thread of any cocoon breaks, or comes to an end, its place is supplied by a new one, which is simply laid on the main thread, to which it adheres by its gum; and, owing to its extreme fineness, it does not occasion the least perceptible unevenness in the place where it is united. In this manner of joining the separate filaments, a thread may be made of any length.

The apparatus for reeling consists merely of an open kettle of water, under which is a fire to keep it hot; and the reel is of the common construction. However simple the operation, great care and attention is necessary in reeling, to preserve the thread of an equal thickness, and of a round form; and that the several rounds upon the reel should not get glued together. When the skein is quite dry, it is taken off the reel, and being made up into hanks, it forms the article, called in commerce, raw silk, of which such vast quantities are annually imported into this country from Bengal, China, Italy, and Turkey.

The raw silk thus imported, is, however, too slender in the thread for the weaving of most articles; the greater part of it is therefore sent to a mill to be thrown, as it is termed; the process of which consists in the uniting of two, three, or four threads into one, previously to giving it that peculiar twist, called organzining.

The machine by which the required number of threads are united, is termed a tramming engine, the construction of which vary considerably, but the following qualifications are essentially requisite in effecting the operation:—The silk must be made to pass off easily, and without entangling, from the delivering bobbins; a slight and equal degree of tension must be applied to each of the component threads, that the compound thread may be made smooth and even; and next, which is very important, that the receiving bobbin shall instantly cease to revolve, if any one of the component threads should happen to break, which often occurs; for without such a contrivance, the thread produced would be very imperfect, and of a variable thickness. We shall now proceed to describe the highly-improved machine by which Mr. W. V. Shenton, of Winchester, performs the operation of tramming; for the account of which we are chiefly indebted to the Transactions of the Society of Arts.

Fig. 1. (page 225) is a bird's-eye view of a portion of the machinery, which may be continued to any extent; *a a* are the axes which give motion to the receiving bobbins *f f*, by means of the wooden rollers *d d*; these are made of any required length to suit a continued series of succeeding bobbins, with a roller under each: the wooden axis which carries the receiving bobbin has a leaden roller, *e*, fixed in it; which receives motion by mere contact, on account of its weight. Two pins are fixed on the leaden roller, to form a stop to its revolution, by means of the catch, *n*, when a thread happens to break; as the receiving bobbin revolves, it draws the threads from two, three, or four bobbins, *g g g g*, as previously determined; and

in order to lessen the friction of these bobbins, which are fitted on wooden pins, *u u u*, the pins are perforated, and ride upon a wire, *v*, and the bottoms of these pins, as well as the loops which hold the wires, are rounded, leaving just friction enough to keep the threads extended: they are shewn separate in *Fig.* 2. Now, should any one of these threads break, it is requisite that the receiving bobbin should immediately stop; for this purpose, a crank wire, *m*, with a catch, *n*, and a fixed crank, *o*, is placed near each roller; over this fixed crank, *o*, are placed four light drop wires, *k k*, which swing freely, and have eyes to hang on the threads, which are their only support; now should either of the threads break, the drop wire, *k*, which hung on it would fall in the crank, *o*, and cause the wire, *m*, to revolve, and bring the catch, *n*, forwards from its position, which would lay hold of the pin of the leaden roller, *e*, and stop it immediately; then as soon as the thread is mended, the thumb is laid on the tails, *w*, of the drop wires, to bring up the fallen one; the thread is then put in the eye, and the catch is withdrawn by turning back the end, *m*, of the crank wire, and the work goes on again. There are two spare notches, *x x*, to every bobbin, to lay them in while joining the thread, that it may be out of gear, and move freely till set right by hand. The silk threads on leaving the bobbins, *g g g g*, pass freely over a glass rod, *i*, and through the eyes of the drop wires, and are then gathered together in passing through the eye of the guide wire, *b*. In order to distribute equally over the bobbins the silk threads thus gathered together, an alternating motion is given to the sliding bar, *c c*, which carries the guide wires, *l*, by means of a pin, *r*, working in an oblique or spiral groove in the block, *b*, on the axis, *a*, and the obliquity of this groove corresponds with the length the silk is to be distributed on the bobbin, causing the sliding bar to reciprocate that length every turn of the wooden roller, or every four turns of the bobbin; the bobbin rollers being one fourth the size of the wooden rollers, *d d*.

The bars, *h h h*, which support the supplying bobbins, are so placed as to make the bobbins stand at right angles with the thread, when it passes from their middle to the glass rod. It is best to make the four eyes of the drop wires lie parallel to the glass rod, which causes their vibrations on the threads to be more equal: *q q* are two sliding wires; it will be seen that where four threads are tramming, the sliding wire, *q*, is drawn back, but where three threads are tramming it is pushed in to support the drop wire out of use, and prevent it acting on the crank wire.

Mr. Shenton's Engine, which we have thus briefly described, is very different in its construction to the machinery employed for tramming in other silk mills, over which, it appears, to possess very decided and important advantages; we have, therefore, given it the preference in our account of the operation, for which it is admirably adapted; and we have the pleasure of adding, that the Society of Arts, with a just sense of its merits, has presented the ingenious inventor with their Silver Vulcan Medal.

[*The Subject to be continued.*]

" *To the Editor of the Register of the Arts and Sciences, &c.*

" Sir,

" You having given ready insertion in your 14th Number of Arts and Sciences to my plan of Coppering Ship's Bottoms, and fastening their sides, may I beg the favour to lay before your Readers, through your much esteemed Register, some hints on Naval Architecture and Nautical Affairs, obtained from long experience at sea and on shore.

" I must first acquaint you, Sir, that I am an Old Sailor and Shipwright, and have served in his Majesty's Navy, in actual service, twenty-three years, and since have built and commanded my own ships in this country and America, in the Merchant Service; that I was seven years Surveyor and Inspector of Shipping at Liverpool, and four years at this port, Bristol, where I am now, *for the Committee of Shipping and Underwriters in London and all parts of the country.* I am also a Naval Architect, and furnish drawings on the most approved plan, for carrying and sailing; but, in order to give some weight to the communication I am about to give to your Readers, I must further acquaint you, that I served an apprenticeship in his Majesty's Dock-yard, at Portsmouth; that in 1780 I embarked in the service of my country in the Royal George, of 100 guns, with Sir John Lockhart Ross, who very soon promoted me, and that I arrived to the height of my profession as Master Carpenter of his Majesty's ship Victory, in which ship I was in two general actions, the last with Earl St. Vincent, on the 14th of February, 1794. Earl St. Vincent, while at Corsica, in the Mediterranean, gave me a warrant as Master Shipwright of the Fleet, and to collect what shipwrights and others I could find in the fleet to keep them in repair. I collected about sixty shipwrights, carpenters, and caulkers, and with those men I kept the whole fleet in thorough and substantial repair, while blockading the French fleet off Toulon, and also the Spanish fleet off Cadiz, in as well and good condition for service as though they had been in an English dock-yard, under the direction of a builder and all his officers, and perhaps 1000 men, for near three years, and saved the nation a sum incalculable. Earl St. Vincent was so well pleased with my conduct and exertions, that he wrote to Earl Spencer, then first Lord of the Admiralty, to promote me into one of his Majesty's dock-yards in England; this promotion I never obtained; but when his Lordship came to the head of the Admiralty himself, he immediately made me Master Shipwright of his Majesty's Naval Yard at Gibraltar.

" I have thought it proper to give this account of myself, as the subject I am about to communicate is of the utmost importance to the nation; and I trust your Readers will perceive that my information is grounded on a tolerable share of experience, in active service at sea, as well as on shore.

" I have been, Sir, for a number of years an eye-witness to the many very expensive experiments which have been tried to cure those destructive evils—the dry and other rot, and it appears they are as

far off as ever from obtaining this object; for our men of war are rapidly going to decay, which will always be the case as long as they follow up the destructive plan upon which they build and repair them at present, and they never will have a sound ship that can be depended on, nor a fleet, on any emergency, to proceed to sea immediately.

"What a lamentable and most expensive circumstance is this for the nation!

"A first-rate, Sir, perhaps, will measure 2,500 tons, and this ship will cost the government at least £40 per ton,—for they use the best of materials in his Majesty's yards, and the work is well put together. *Forty* pounds per ton amounts to the *moderate* sum of *one hundred thousand pounds* the ship, when completely built, launched, and laid up at her moorings. In four or five years she becomes *rotten*. She is then put into dock, taken to pieces, and rebuilt; in doing this she will cost a great deal more; for they have the taking to pieces as well as the rebuilding to pay for. Then what a state must our navy be in at this moment! Are our men of war, in the name of Heaven! to lay sweating and rotting at their moorings in this way? Has there ever been a committee called to enquire into this evil, or the cause of this rapid decay in our men of war? Should an evil of this magnitude be left to cure itself, or to find its own remedy?—for the remedy is not yet found to prevent it I am certain. When you want a ship for actual service you are obliged to go and pick one out, as you would a sound potatoe from a number of rotten ones; but I cannot now take up more of your valuable time and Register; in my next, I shall endeavour to point out the cause of this decay, and condemn totally the manner and way you at present build your men of war, which is the real cause; and finally give you some hints towards their improvement, and a remedy to keep your men of war sound and healthy at least for 20 or 30 years; and I sincerely hope, for the good of the nation, it will catch the eye of the Admiralty, and that they will not lose one moment's time in putting it in practice, when I shall reveal my thoughts and experience on this subject.

"I am, Sir, Your's, &c.

"EDWARD CAREY.

"Surveyor and Inspector of Shipping at Bristol, and late "Builder at H. M. Navy-yard at Gibraltar."

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"April 19th, 1824.

"HAVING read your statement of the proposed improvement in the Public Sewers, permit me to observe, that I think it well calculated to answer the end intended, yet it appears to me, that an improvement might be made in the mode of cleansing the cesspool.

"After having explained the section of a Sewer, on the improved

construction, you observe that 'the ponderous matter may be re-'moved by means of a rake, or other proper instrument.' I conceive, sir, that this could not be so easily accomplished by the method there proposed; the ponderous matter lying at the bottom of the cesspool, under several feet of supernatant water could not be removed by a rake or any such instrument; it is true, that some of the larger and lighter substances might be brought up by the rake, &c. and by agitating the contents of the cess-pool a part of the less ponderous matter might be made to flow off with the water, but this would lodge at the bottom of the Sewer, and in time fill it up; but by the method I beg leave to propose, this would be entirely obviated, and the Sewer would never want cleaning.

"I propose, then, that each cess-pool be furnished with a cast-iron box, or trough, to be made of any convenient depth, (say two feet) exactly to fit the bottom of the cess-pool, and furnished with a hook and chain, by which it may be drawn up with a winch or capstan to the mouth of the well, and cleaned with ease and then let down again.

"One winch or capstan will serve for a whole parish, and might be made to remove from one place to another on truck wheels, and be an appendage to the scavenger's cart; the operation of drawing up the trough and cleaning it might be accomplished in ten minutes, and might be done in the morning before the inhabitants are up, consequently there would be no nuisance.

"The objections to the plan proposed on the score of expences I conceive will vanish into nothing, when weighed against the advantages to be derived from it. If, Mr. Editor, you think the above hints are worthy of notice, they are at your service to make what use you please of them.

"I am, Sir, your obedient Servant,
"And a constant Reader of your valuable Publication,
"T. W."

REVOLVING UMBRELLA.

The eternal principle to which all mutable matters are subject, displays itself alike in each. The Revolving Umbrella, after having moved round its axis in a most eccentric orbit, has again come round to us. It is a part of our system to take all things in rotation, and we felt sorry that the circle of our readers should be deprived of the knowledge of any improvements in rotatory engines. We now therefore re-turn to it with increased attraction, and trust that it may be turned to some advantage.

Skiager's improvement is to avert 'the thousand natural ills which wrists are heirs to,' consequent 'upon the concussion of conflicting umbrellas, in storms and crowded neighbourhoods, rendered more violent by the long leverage between the periphery and the handle,' by causing them to perform with the slightest possible *momentum*, a constant revolution. His letter is long and luminous, but as he appears to leave the mechanism of the thing in the hands of the 'craft'

we abstain from extract. He anticipates a great many, or rather many and great advantages from its introduction, and instances the important fact, that as concussion, or the wind, which is just as good, will cause it to move round with great velocity, every falling drop of rain must start off at a tangent, and leave the Umbrella an unmoistened body in positive torrents, whilst it yields protection and security to the moving body which it shelters.

Fig. 1.

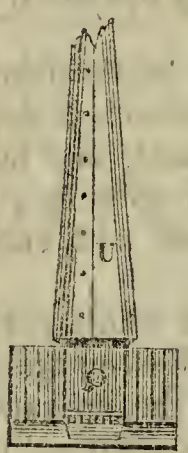


Fig. 2.

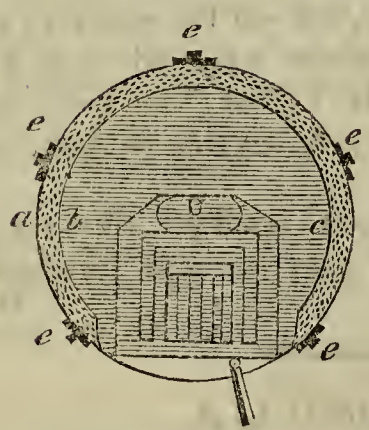
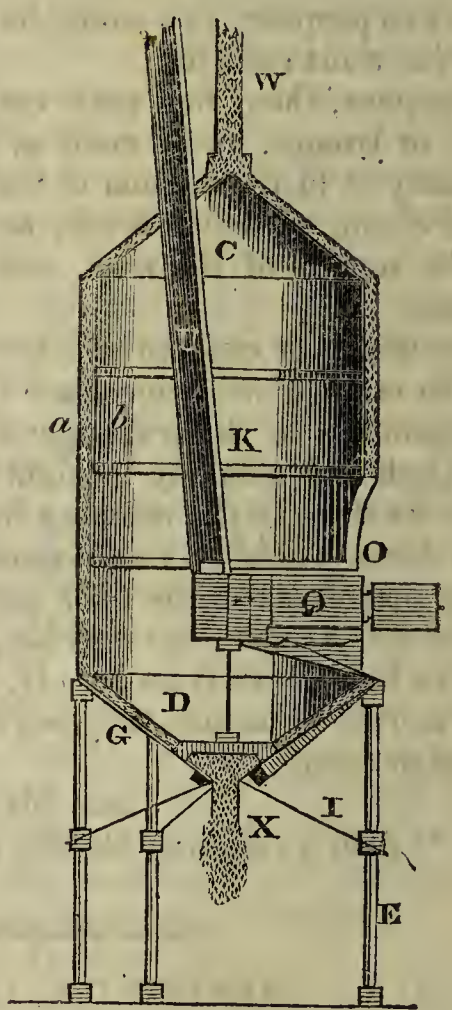


Fig. 3.



MR. JONES'S* VERTICAL KILN FOR DRYING CORN, PULSE, &c.

The object of this truly valuable invention is the preservation of the chief article of sustenance, and for which, indeed, it is most happily calculated, by the extreme facility it affords of speedily drying, in the most effectual manner, large quantities of damp or mildewed corn.

In this changeful climate it not unfrequently happens that crops of the various grain are necessarily carried from the field in a state of considerable humidity, owing to the prevalence of wet weather. The consequences that ensue, if the means are not at hand to dry it rapidly, are in the first place mildew and mouldiness, which materially deteriorates its nutritive and wholesome qualities, and conse-

* Mr. James Jones, of 150, High Holborn.

quently reduces its value in the same proportion; and if the drying of it be not effected whilst in this early state of change, a fermentation commences, which rapidly proceeds to an entire decomposition of the farina, when not only are all its nutritive properties annihilated, but it becomes a disgusting nuisance.

The usual method resorted to of drying damp grain, is by means of the common kiln, which consists of a floor formed of large tiles, perforated with numerous small holes; in some kilns, however, perforated iron plates, or fine wire-work, are used instead of the tiles. Under this floor is situated the stove or fire-place, which is generally made nearly of the figure of an inverted pyramid, whose base is equal to the area of the floor; at the other, or contracted end of this figure, is situated the fire, composed of coke, culm, or other fuel. From this fire the heated air and gaseous vapours ascend, spreading unequally over the inferior surface of the floor, passing through its perforations and the interstices between the grains, which are spread over the floor in a layer of considerable thickness. It is then turned over with a large wooden shovel, from time to time, until the drying is completed, in the best manner this defective mode is capable of. For it must be evident that the heat cannot be distributed so as to dry perfectly the whole, without injuring a portion by the application of too much heat. The lower stratum, receiving the heat at first, causes the moisture to pass from it in the form of vapour, which for the most part is condensed by the humidity and coldness of the upper stratum, and deposited thereon. The upper stratum is thus charged with a greater portion of moisture than it previously possessed, and on being turned over and placed next to the floor, the previously dried upper stratum now absorbs again a great portion of moisture. Without going farther into the detail of this operation, we think it must be evident that this mode is at best very defective, and extremely tedious.

Mr. Jones's Kiln is constructed in the following manner:—Fig. 1 is a vertical section of the apparatus, which is formed of two iron cylinders, *a b*, placed one within the other, each being closed in at the upper and lower end by two concentric cones, C D; the annular space between the cylinders and upper and lower cones is an inch and a quarter in width, for the reception of the grain to be dried as it passes through the machine; both the internal and external bodies are perforated throughout, with about 2300 holes to the square foot. The outer cylinder is 6 feet $2\frac{1}{2}$ inches in diameter, and the length between the apex of its cones about 12 feet. The kiln is supported on five cast-iron columns or legs, 6 feet 6 inches high, three of which are shewn in the section as at E; these are attached to a strong iron ring, which surrounds the base of the cylinder. From the heads of these columns descend along the sides of the cone five long bolts, as at G, which are passed through the same number of lugs in the cast-iron ring, surrounding the neck of the lower cone; from the same ring proceed five stays, as at I, which are fastened to the middle of the columns by a nut on each side. The body is sustained, both internally and externally, by iron hoops, as at K, and

the distance between the cylinders is preserved by a number of short stays. In the front of the kiln is cut out a space, as at O, in which is fixed the fire-place, through which are passages for the heated air to pass into the cylinder. These passages, as well as the flues which proceed circuitously from the fire to the chimney, are best shewn in the horizontal section, fig. 2; and in the vertical section of the detached fire-place, fig. 3.--Q is the fire hole, S the ash hole, T the fire bars, and U the chimney, which passes up nearly in the middle of the kiln. The fire is thus perfectly insulated, so that but a small portion of its heat can escape, without having first performed its destined office. The wheat is now admitted into the kiln from above by means of a hopper through the tube W, which falling on the apex of the internal cone, C, is distributed equally on all sides, rolling and sliding over its surface, and filling up the space between the cylinders; here the grain would perhaps descend bodily, were it not for the roughness on the inner surfaces of the iron plates, owing to the punching of the holes, which leave so many thousand little projections, producing not only a resistance to the too rapid descent of the corn, but likewise a constant slow, rolling, intestine motion, whereby every individual grain is exposed alike to the same degree of temperature. The grain from thence converges in the lower cone, and ultimately escapes through the spout at the bottom, either into sacks or on the ground, as may be required.

It will be seen, that by this apparatus a very thin, yet extended stratum of grain, is exposed to the action of the heat; that every single grain is kept constantly in motion during its progress through the machine; and that it may be passed through either quickly or slowly, as may be best suited to its peculiar condition, by enlarging or contracting the aperture through which it is discharged. The moisture is carried off by evaporation through the perforations of the plates, and with much rapidity, owing to the well-regulated disposition of the heat and the currents of hot air that are made to pass through the machine. These kilns may of course be made of any size; the one we have described has been proved to be capable of perfectly drying more than 100 quarters of wheat in 24 hours; in short (for we have not space to detail half its advantages), *it is one of the most admirable and really useful machines ever invented.*

IMPROVEMENTS IN AXLE TREES.

We observe in Mr. Henry Palmer's recent work on Rail Roads the following remarks, which we think deserving of some attention, and as likely to prove beneficial if carried into practical effect. He says that, "During a succession of experiments, occasionally for many months, I invariably perceived, that when fresh oil was applied to the axles of the carriage, *the resistance was increased*, and it required the ordinary motion of the carriage for several days to restore the resistance to its usual standard. No other presumption occurred to ac-

count for this fact, than the possibility of the oil being better adapted for its office after being some time exposed to use. It was suggested by a scientific acquaintance, that the oil became thickened, or less fluid, after exposure to the air, and was therefore better able to resist the contact of surfaces. In order to prove this, I thickened some oil artificially, by the admixture of a small quantity of bees' wax, but the appearances were the same as before. It then occurred to me that there was not sufficient play, or difference of diameters, between the axle and the nave in which it worked; I therefore had the axles slightly reduced. On again measuring the resistance, I found circumstances as before, but differing in amount, the resistance being slightly increased. I was by this time convinced that the quantity rather than quality of oil occasioned the appearances; to prove which the axles were made perfectly clean, and then simply moistened with oil by the finger previous to inserting them in the wheel. In this state the resistance was again measured, and found to be *similar to the standard usually observed* after the carriage had been some days in motion as before described. It being then proved that the *quantity* of oil occasioned the difference of resistance, the following solution of the manner in which the additional quantity could produce such an effect, appeared reasonable :—

Fig. 1.

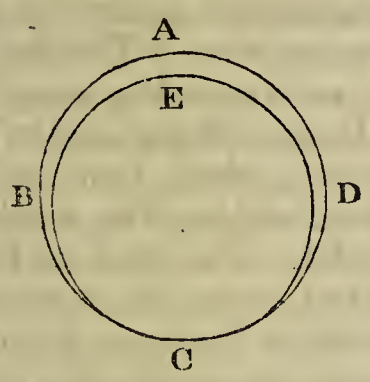
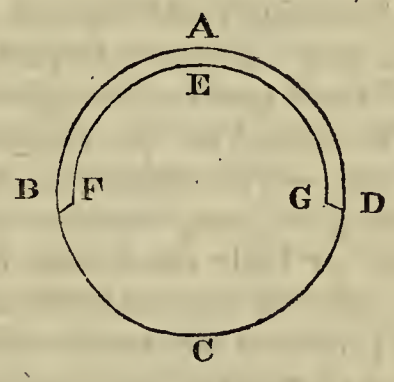


Fig. 2.



Let A, B, C, D, Fig. 1, represent the circle of the hole in the nave of the wheel, and E, C, the section of the axle. The circle E, C, touches A, B, C, D, only in the point C. A very acute angular space then remains between A, E, and C, on either side of E, C. If that space be filled with oil, the oil may be considered as a wedge, and if the outer circle be set in motion, that wedge will endeavour to pass the point C. But it cannot pass in its present form without raising the circle E, C; but E, C, having the weight of the carriage upon it, would resist its passage.

"Now this continual and unsuccessful endeavour to pass the point C, will occasion an impediment to the motion.

"To put this solution to the test, the axles were formed as in Figure 2. A, B, C, D, is the hole in the nave as before, and E, F, C, G, the section of the axle. The lower semicircle of the axle here corresponds with, or is parallel to the outer circle, but no farther, because, *if it corresponded throughout the circle, the axle would be liable to jamb, as other experiments have proved.* The coincidence then ceases abruptly, as at B, F, G, D, and the space above, which

contains the oil, is not angular, but the quantity of oil which is to pass toward the lower semicircle is determined at B or D.

" On measuring the resistance with the axle thus formed, I found it not increased by any quantity of oil that might be inserted, but by dispensing with the angular space and consequent wedge-like action of the oil, *the resistance was one-tenth less than the former standard.* In cases where the difference of diameters is considerable, I do not apprehend the obstruction from the quantity of oil would be of consequence : but it is desirable to make the bearing surfaces nearly to correspond, to obtain a greater *width* of touching surface, and the more perfectly to govern the motion. The form of axle just described is in fact the converse of a well made plummer block used in machinery."

[We suspect there may be more in this than meets the eye, and we wish some of our Correspondents would direct their attention to a subject, which, if properly handled, we are free to confess we think promises some reward.]

PROPOSED BRIDGE OP SUSPENSION OVER THE THAMES FROM TOWER HILL TO BERMONDSEY.

The following particulars of this stupendous undertaking we extract from Capt. Brown's Report on the subject. " The Bridge is to consist of *three spans of* 600 *feet each, and two side spans of* 300 *feet each.* The extent of the Suspended Bridge, including the Towers, is 2,400 feet.—The embanked approaches, which form an integral part of the plan, are, together, 900 feet, making the whole extent 3,300 feet, or little more than half a mile.—The road on the north side is to take its rise on Little Tower-hill, near the bottom of the Minories ; that on the south side near Dock Head, in Bermondsey, which forms a central point to the streets leading to the great Kent and Surrey Roads. The rise from its commencement on each side, is formed by an easy acclivity of 1 foot perpendicular to 20 feet horizontal.—The carriage-road of the Bridge is to be 21 feet wide, the foot-path on each side 8 feet wide.—*The height of the Bridge above high water mark* 70 *feet in front of the Towers,* rising gradually to 75 feet in the centre. This height will allow ships of 200 tons to pass under without striking their top-gallant masts, and ships of 300 or 400 tons to pass with main-top-gallant masts down.—The Towers will be constructed of granite.—Each of the Bridges will be supported by 64 principal bars or bolts of suspension, $2\frac{1}{2}$ inches diameter, as shewn in the designs.——The bolts will be 20 feet long, joined by side plates and pins of proportional strength. They will be extended, from their respective points, over the towers, in four rows, over each other, one foot apart, each row to consist of four lines of bolts, parallel with each other. Those principal lines of supension may now be denominated chains, although differing from the *common* form and *usual acceptation* of the word. The joints being exactly opposite to each other, the saddles which

support the perpendicular bolts rest on them, and bear equally on all. The principal suspenders are so arranged, that the beams are alternately supported by a different row of chains, so that an equal strain is produced; as, for instance, the first joint from the towers is 5 feet long, and supports the first beam; the second joint is 10 feet long, and supports the second; the third is 15 feet long, which supports the third; and the fourth is 20 feet long, and supports the fourth beam. The others are all 20 feet long.—Having thus set off with different lengths, this alternate system extends over the whole, and the perpendicular bolts are all five feet apart, corresponding with the distance of the beams.

"The foregoing plan renders the united strength of the principal suspenders certain." Capt. Brown then proceeds to calculate the strength "from the known principles of the catenarian curve, and the strength of iron, as found by so many accurate experiments;" from which he deduces that—"The least force that would break down the whole of the main suspending chains in any one span is 3,904 tons, and the least force that would strain them in stretching is 2,170 tons.

"The centre division of any span of the Bridge would contain 20 waggons, with 8 horses, which, taken at 12 tons, including the weight of the horses, is 240 tons; a promiscuous collection of carts and waggons would perhaps be nearly the same; there could not be room for many other vehicles, but allowing 60 tons for horses and droves of cattle, say 300 tons. The side paths are to be solely appropriated for foot passengers, and it is just possible to place (allowing 2 feet in breadth, and 15 inches in width for each) 3,648 persons on both sides, which, at 11 stone, is 250 tons. The total weight which it is possible to load on the area of any one division is therefore 550 tons; so that, in this extreme case, there would be 2,604 tons less weight than would break down the main chain, and 870 tons less than the weight that would stretch them.

"This calculation of a single span applies to the others; if the whole area were filled, it would contain 14,592 people, or 1,003 tons, and there would be a burden of 1,200 tons in waggons and carriages; those, together with the weight of the Bridge, make the whole strain 5,200 tons; but then we have the strength of all the main chains in the respective spans, viz. 15,616 tons, to support this, or 10,416 less than would break down the Bridge, and 3,480 less than would stretch them.

"This I consider to be a surplus of strength, that will be deemed quite sufficient even with the most caution mind; but in a Bridge of Suspension, we are not at all limited to strength, more than in any other structure. I can increase either the number of the chains, or the diameter of the bolts; a due regard to economy, and mechanical proportion, however, should always prevail, and guide us in rejecting whatever is not absolutely useful and necessary. Every part of the Bridge can be taken out, and renewed in detail, without either endangering its strength, or disturbing the passage. All the principal chains might be covered close round with thin sheet lead, which

would not only be impervious to water, but the joint, or seam, which would be *under* the chains, might be soldered, and prevent the action of the atmosphere altogether.

"It is necessary to state most unequivocally, that no hinderance whatever will be created, either in the river or the adjoining streets, during the erection of the Bridge. When the towers are finished, chains of sufficient strength to carry a temporary gangway will be stretched across, which can be hove up in half an hour; the principal bolts will be hoisted up to the temporary Bridge, and the whole put together aloft."

MISCELLANEOUS & SCIENTIFIC INTELLIGENCE.

La Place on the Form and Structure of the Earth.—La Place has given the following very interesting results, as deduced from analysis, and from the experiments made with the pendulum in both hemispheres.

1. That the density of the strata of the terrestrial spheroid increases from the surface to the centre.

2. That the strata are, very nearly, regularly disposed around the centre of gravity of the earth.

3. That the surface of this spheroid, of which the sea covers a part, has a figure a little different from what it would assume in virtue of the laws of equilibrium if it became fluid.

4. That the depth of the sea is a small fraction of the difference of the two axes of the earth.

5. That the irregularities of the earth, and the causes which disturb its surface have very little depth.

6. That the whole earth has been originally fluid.

"These results," says La Place, "of analysis and experiment, ought, in my opinion, to be placed among the small number of truths which geology presents."

Preservation of Fruits by Carbonic Acid.—The details of some very interesting experiments will be found in the *Ann. de Chim. et de Phys.* (Jan. 1819), tending to prove that Fruits may be preserved by means of carbonic acid gas. Cherries, grapes, pears, apples, and chesnuts, were placed in glass vessels filled with this gas, obtained from carbonate of lime by sulphuric acid. Neither the colour nor the taste of the cherries were altered at the end of fifteen days; and at the end of six weeks they were in the same state as if they had been preserved in brandy.

Atmospherical or Meteoric Dust.—Professor Rafenesque of New York, asserts, that an imperceptible dust falls at all times from the atmosphere, and that he has seen it on Mount Etna, on the Alps, on the Alleghany and Catskill mountains in America, and also on the ocean. This is the same dust, he asserts, which accumulates in our apartments, and renders itself peculiarly visible in the beams of the sun. He has found it to accumulate at the rate of one fourth of an inch to one inch in a year; but in such a fleecy state,

that it could be compressed to one third of its height. Hence he takes the average of the yearly deposit at about one sixth of an inch.

Geognostical Situation of Lapis Lazuli.—Mr. Mohr has ascertained by actual examination, that the lapis lazuli of the lake Baikal occurs along with calcareous spar and silver white mica in a vein which traverses granite.

Singular Heat developed in the Fusion of Tin and Platinum.—A very extraordinary heat is developed by fusing together Platinum and Tin in the following manner. If a small piece of tin foil is wrapped in a piece of platinum foil of the same size, and exposed upon charcoal to the action of a blow-pipe, the union of the two metals is indicated by a rapid whirling, and by an extreme brilliancy in the light which is emitted. If the globule thus melted is allowed to drop in a basin of water, *it remains for some time red hot at the bottom;* and such is the intensity of the heat, that it melts and carries off the glaze of the basin from the part on which it happens to fall.

Phenomena observed in Proving the Strength of Iron Bars.—"It is interesting and important to note the changes that iron undergoes in proving bolts or bars. It seems perfectly rigid and unaffected by any force less than five-ninths of its measure of strength, when a change is indicated by small exfoliations, or scales, from its surface. This is the consequence of the bolt stretching, and necessarily lessening in diameter, and a certain proof of its yielding is the phenomenon of its becoming sensibly warm: the heat increases in the ratio of the strain, and when the rupture takes place, which is generally near the middle, it is almost too hot to hold.—I have found that a 2-inch bolt, 12 feet long, and 2 inches diameter, was torn asunder horizontally by my machine, which is on the lever principle, like the weigh-bridges in the Royal Dock Yards, with a strain of 82 tons; it began to stretch with 47 tons, and lengthened, during the experiment, 2 feet 9 inches, and was reduced, at the point of rupture, to $1\frac{5}{8}$ inch diameter."—*Capt. Brown's Report on the proposed St. Catherine's Bridge.*

Analysis of the Water of the Dead Sea.—M. Gay Lussac, in analysing the Water of the Dead Sea, brought home by M. Le Comte de Forbin, found it to consist of

Muriate of soda.....	6,95
Murate of lime.....	3,98
Muriate of Magnesia.....	15,31
	26,24

Specific gravity at 17° centigrade, 1,2283. It contains also a small quantity of muriate of potash, and traces of a sulphate, which is, probably, sulphate of lime.

[A Correspondent, (D. M.) has forwarded us the following recipes, for which he assures us that he can vouch from his own knowledge. We give them insertion, but of course we cannot pledge ourselves to their efficacy.]

To make Imitative Marble.—Take plaister of Paris, quick

lime, salt, ox blood, *stones of different colours*, and pieces of glass; beat them to an impalpable powder, and mix them up to the consistency of a paste by the agency of beer, or some milk. When thoroughly dried in the form which is intended to be given to it, rub it with a very fine sand paper, and polish with leather and oil.

To SOFTEN IVORY AND BONES.—Submit these substances to the action of aqua fortis for twelve hours, and subsequently to the juice of *berries*, (qu.) and they will become so softened as to admit of being shaped into whatever form it may be desired to give them. They may again be hardened by placing them in strong vinegar for four hours.

To RESTORE FADED GILDING.—Faded or tarnished gilding may be restored by moistening the parts with clean water in which alum has been boiled.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

PREVENTION OF SMOKE.—To the person who shall invent and produce to the Society, the best and easiest means, superior to any now before the public, of preventing the emission of the dense smoke from the chimnies of steam engines, breweries, and manufactories.—The Gold Medal, or Fifty Guineas.

PURIFICATION OF COAL GAS.—To the person who shall discover the cheapest method of purifying the inflammable gas procured from coal, superior to any method now in use.—The Gold Vulcan Medal, or Thirty Guineas.

RENDERING LEATHER WATER PROOF.—To the person who shall discover a method, superior to any now in use, and of moderate price, of rendering leather water-proof, without injuring its texture or pliability.—The Silver Medal, or Fifteen Guineas.

RECENT PATENTS.

To JOHN GUNBY, of New Kent Road, Surrey, sword and gun manufacturer, for his new invented process, by which a certain material is prepared, and rendered a suitable substitute for leather.—28th Feb. Six months.

To WILLIAM DARKER MOSELEY, of Radford, Nottinghamshire, lace manufacturer, for improvements in machines for the manufacture of lace or net, called bobbin net,—15th March. Six Months.

To HENRY BERRY, of Abchurch Lane, London, for certain improvements on a machine, or apparatus, for more readily producing light.—20th March. Six Months.

TO OUR READERS AND CORRESPONDENTS.

Mr. Willoughby's Accelerating Improvements in Naval Architecture.—The continuation of this subject is unavoidably postponed till our next.

L. H's communication, accompanied with a drawing, we have received, and will endeavour to give it insertion in our next.

YANG-SI's description of the amusements of the Chinese, howveer interesting, is unsuited to our publication. We sincerely recommend him to publish it in a separate form.

We thank E. A. B. for his friendly letter and enclosure; we are doubtful whether there may not be some difficulties in the way of its publication by us.

The numerous queries we have received relative to several subjects that have appeared in the Register, will receive our earliest attention.

We are doubtful if the postscript to the letter of our correspondent, E. C. was intended for insertion, or not, we have therefore omitted it.

[*To be continued every* FORTNIGHT.]

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REGISTER

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IMPROVEMENTS & DISCOVERIES.

No. 16.] SATURDAY, MAY 15, 1824. [Price 3*d*.

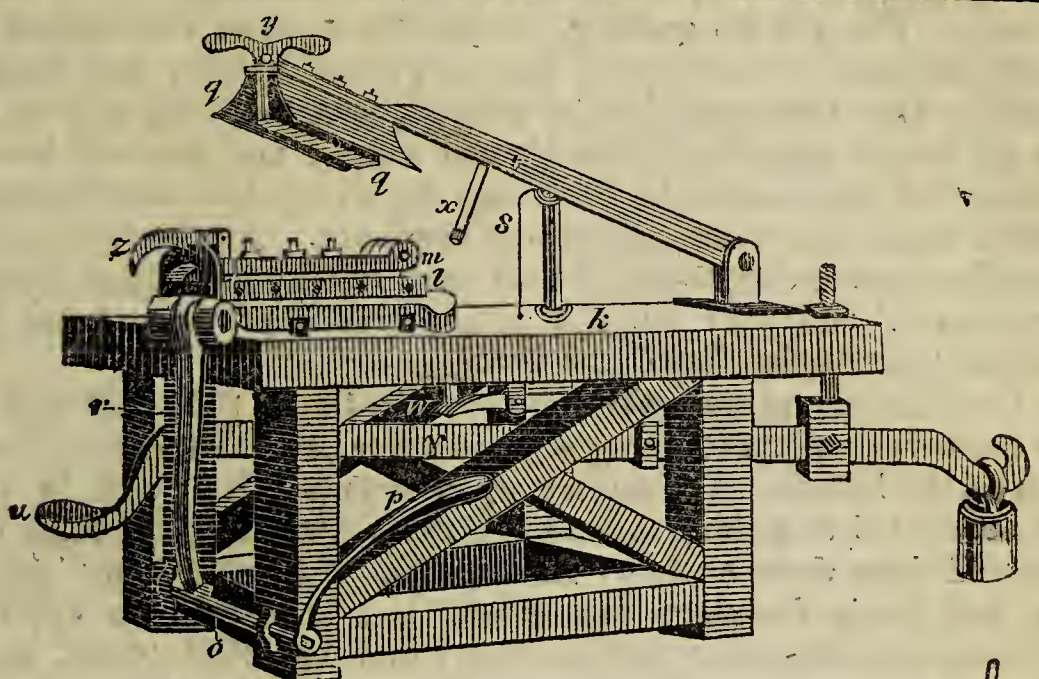


Fig.3

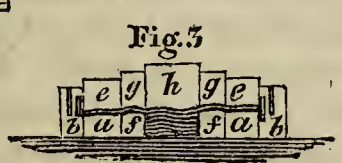


Fig2

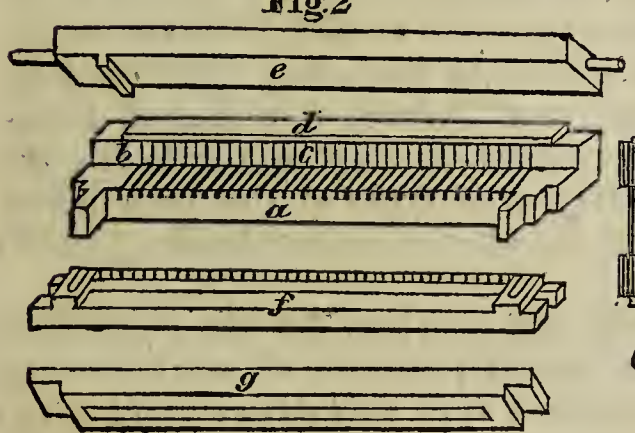
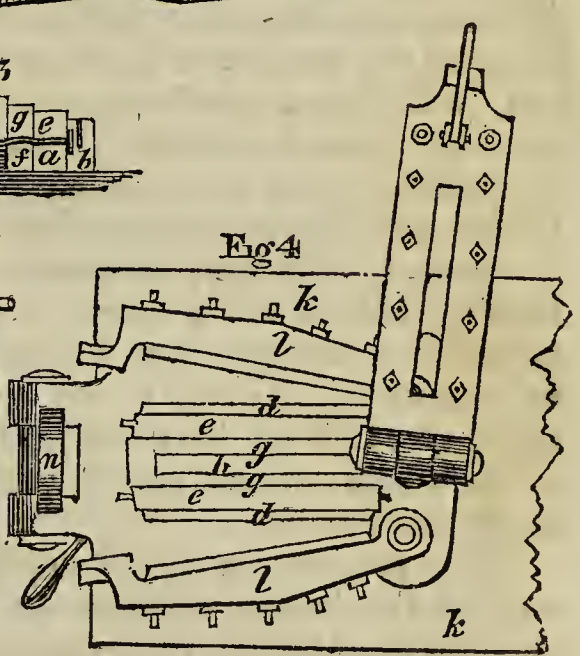


Fig4



TYPE FOUNDING MACHINE.

To the noble invention of forming moveable letters or types may justly be ascribed all the mighty effects of that intellectual luminary the Printing Press, before whose powerful influence the spells of superstition are dissolved, and the fetters of ignorance are broken for ever.

The invention of types is said to have taken place at Mentz, in the early part of the fourteenth century, when they were formed of wood. Some time afterwards they were cut on metal, and one

Laurentius was honoured as the inventor of this improvement. The art of founding or casting types quickly succeeded, which appears to have had its origin also in Germany, as we find they were first introduced into Holland from Strasbourg. By the mercantile activity of the Dutch at this period, the new metal type was rapidly dispersed into all the capital cities of Europe.—The earliest use of them in this country was at Oxford, in 1468, when a book was printed there by one Bouchier. In 1471, Caxton, who had studied the art in Holland and the Low Countries, established several printing presses in this country. The art of reading, which but a short time before was chiefly confined to a portion of the clergy and nobles, was soon extended to the other gradations of society; and the being able to read was no longer considered the highest climax and finish of an education, but was made the first step to it, by the introduction of printed books into every school and seminary. As the rudiments of education became improved, books were rapidly multiplied, printing encouraged, and ever since a progressive improvement has been gradually developing itself.

Until the seventeenth century types continued to be cast with very few improvements, excepting such as arose from alterations in the form of the letters. Caslon set up a foundery for types in 1720, and succeeded in making several improvements, to which some valuable additions were made by Baskerville, of Birmingham. Messrs. Fry and Son's foundery was established in 1764. In 1770 Mr. Jackson cut some very extraordinary and beautiful types, and he invented the method of founding the large types by a mould and matrix, which were previously cast in sand. Mr. V. Figgins, in 1792, produced some beautiful type for the Persian, Greek, and Hebrew characters, never before attempted in this country. In 1800 Messrs. Caslon and Catherwood set about re-cutting and improving the whole business, and the superior taste and elegance displayed in their manufacture, occasioned a spirit of rivalry in the other type founders, particularly Messrs. Fry, Figgins, and Thorne, who exerted themselves individually not to be surpassed by their competitors; the effect of which has been the production of types of that high degree of excellence, which marks the character of all our books, printed since that period.

The preparation of the moulds and matrixes for the purpose of casting the letters requires the utmost precision of workmanship, and the ingenuity of their construction is so well deserving of attention, that we regret our limits will not permit us to give the necessary drawings and description, together with the precise manner of using them. The matrix itself is simply a piece of copper or brass, about an inch and a half long, and of a thickness in proportion to the size of the letter to be cast. In this piece of metal is sunk the face of the letter, by means of a steel letter punch. These punches being made with every size and kind of letter, are of course very numerous; and the making of them requiring the utmost nicety of execution, necessarily forms a branch of the type-founder's business of considerable importance.

There are about 20 different sizes of types in general use, all of

which are cast in moulds and matrixes, besides several larger sorts, which are cast from patterns in sand. The following table gives the designation of the 20 sizes alluded to, and the spaces they occupy in printing. They are sold to the Printers by the pound; the smallest being about 13 shillings and the largest about 2s. 2d. per lb.

	lines to each foot.		lines to a foot.
Diamond type contains	204	Great Primer contains	51
Pearl	178	Paragon	44½
Nonpareil	143	Double Pica	41½
Minion	128	2 line Pica	35¾
Brevier	112½	2 line English	82
Bourgeois	102	2 line Great Primer	25½
Long Primer	89	2 line Double Pica	20¾
Small Pica	83	Canons	18
Pica	71½	4 line Pica	17¾
English	64	5 line Pica	14¼

When the moulds and the set of matrixes are duly prepared they are brought to the furnace, and consigned to the hands of the castor. The furnace is built of bricks upright, with four square sides; the stove for the fuel is at the top, with a round hole made through it, to receive the pan which holds the metal. In a large foundery there are several of these kinds of furnaces. The caster begins his work by taking the mould in his left hand, and with his right puts back a spring which keeps the matrix close up to the face of the mould, and then with a small ladle adapted to the size of the work, he dips out of the pan over the furnace a sufficient quantity of the fluid metal to fill the mould, and at the same instant that he turns the metal from out of the ladle into the mouth of it, he throws up his hand in which is held the mould with a sudden jerk or shake, and by this movement forces the melted metal down into the face of the matrix. In this operation great expertness is necessary. After the letter is thus cast, he releases the spring and takes the face of the type from the matrix, which is done by pressing the thumb of the right hand against the top of the matrix; he then picks out the type, and goes on with the casting. Thus, in the casting of every single type, there are several distinct operations to be performed; yet, owing to the admirable adaptation of the apparatus for the purpose, an expert caster can on an average make from six to seven thousand letters per day. When the caster has cast as many types of the same letter as are required, he exchanges the matrix, for one containing another letter, and proceeds as before. The types after being cast are received by the "*break-off boy*," who takes off the break or rim of the letter: this operation is performed with so much expedition, that some boys will break off from 5 to 6000 in an hour. From the "break-off boy the new types are put into the hands of a "*rubber*," to have their rag or beard removed, which is effected by rubbing them over a stone. A great number of boys are employed in a type foundry besides those mentioned in the various processes of the manufacture;—such as "*kerners*," "*setters up*," "*dressers*," &c.—their operations being directed to the perfecting of the form and

finishing of the type; a circumstantial account of which our limited space will not admit of.

The metal of the type founder consists of lead and antimony fused together, the proportions of which are regulated by the size of the type to be cast.—The smallest sized types requiring the hardest metal, the alloy for these is 25 of the regulus of antimony to 75 of lead in 100 parts; in the larger sizes, the proportions are varied accordingly, and down to 15 parts of antimony to 85 of lead. The usual method of casting the larger kind of types, is by cutting the letter through a plate of brass, and afterwards rivetting to it a back, to form a matrix. These moulds are hung up, and the liquid metal simply poured into them. The very large letters are cast in open sand, in the usual way of brass casting.

The moulds and matrixes of the type founder are extremely valuable, and are therefore secured every night in strong rooms of iron or stone.

By the common method of type founding, which we have now briefly described, only a single letter is cast at a time, and the operation has been nearly the same for upwards of seventy years. A scheme was however set on foot by a Mr. White, about seventeen years ago, to enable the founder to cast a great number of letters at one time, thirty, or more; but it was not carried into practice by any of the founders. About the same time, a Monsieur Didot, assisted by Mr. Donkin, the Engineer, constructed a machine for a similar purpose; which was also intended to perform all the operations of the work, by the assistance of a boy only.

The invention which we have now to describe, and which forms the frontispiece of our present Number, is an improvement by Monsieur Didot (who now resides at Paris) upon his former highly-ingenious machine, now rendered capable of casting 200 types at once, and to repeat the operation two or three times in a minute. A Patent for this country has been taken out by Mr. John Louis Pouchée, who has established a large type foundry in Little Queen-street, Holborn, where the machinery is at present in full and successful operation.

The great number of drawings which accompany the specification of this Patent obliges us to select such portions only as will best give a just idea of its nature and construction, and we have for the same reason thrown the side views into perspective, which exhibits the machine entire, as at Fig. 1.—Fig. 3, represents one side of the mould separated into its component parts. Fig. 2, is a section of the several bars, composing both sides of the mould. Fig. 4, exhibits a plan of the same, fitted into, and encompassed by a frame of iron; a horizontal and perspective view of which is given at Fig. 1.—The same letters refer to the same parts in each of the figures.

a, Fig. 3, is a steel bar, with horizontal grooves, in which are formed the bodies of the types; *b b* is the bar which holds the matrixes *c c*, each of which is arranged opposite to its respective groove in the bar *a*, to which it is screwed fast; the bar *d* is then screwed down to the bar *b*, which holds the matrixes *c c* firmly in their places.

The bar *e* is next laid upon the bar *a*, which covers the grooves, and forms the upper sides of the square recesses, shewn also at *e e*, fig. 4 : —*f* is the break-bar, and is placed in front of the bar *a*; a series of small nicks or openings are made in this bar, through which the fluid metal passes into the grooves and matrixes, where the body and letter of the type is cast; the grooves are closed by the spaces between the nicks of the break-bar coming against them and forming the feet of the types. The bar *g* is laid upon the break-bar as a cover to it, and the whole six bars thus combined form one side or one half of a pair of moulds, shewn in section fig. 3. This section likewise exhibits the form of the apertures through which the fluid metal has to pass into the grooves and matrixes; *h* is a receptacle between the moulds for the fluid metal, previous to its being forced into the moulds, as we shall presently describe.

In preparing the moulds for casting, the several bars composing them are connected together as before-mentioned, and laid upon a solid metallic bed upon the table *k k*, as shewn at fig. 4 : the sides of the iron frame *l l*, which turn upon joints, are then brought to bear sideways against the moulds; the top piece *m*, which also turns upon a joint, is brought down over the mould bars, which it firmly secures, by bringing the looped part of the swinging lever *n* shewn at fig. 1, over the end of the top piece *m*; which is effected by the aid of the hand lever *p*, forcing the tongue *o* against the lower end of the swinging lever, when the latch *z* falls and makes all fast. Thus prepared, a sufficient quantity of the fluid metal is poured out of a ladle into the receptacle between the moulds; a trigger at *r* is then pulled, when a string connected to it draws back a bolt or catch, *s*, which supports the long lever *t*, and allows it to fall with the rammer *q* into the receptacle, which "drives with considerable force the fluid metal from thence into the moulds and matrixes." On each side of the rammer *q* are fixed "a guard or housing, to prevent the liquid metal from being splashed over the operator." In order to withdraw the types from the moulds, the workman places his foot upon the step *u*, when the compound lever *v* acts upon the pin *w*, under the leg *x*, and forces out the rammer from between the moulds, which is then lifted up by the workman until it has passed the catch *s*, which supports it in the position shewn in the figure. The mould is then opened, by throwing up the hasp *z*; the swinging lever *n* then releases the end of the top piece, and allows the frame to be opened, and the moulds to be removed to a table, where the bars which compose it are placed under cramps, and separated by means of wrenches : the types are then removed, and undergo the operations of dressing, &c., as mentioned in the early part of our subject.

THE MANUFACTURE OF SILK.

(Continued from page 228.)

All kinds of Silk, which are simply drawn from the cocoons by reeling, are termed Raw Silk, but are distinguished by several deno-

minations, according to the number of fibres which compose the thread. As raw Silk is very rarely used without being dyed, it is necessary to prepare the thread for that process, by giving it a twist, which enables it to withstand the effect of the hot liquor, without separating the fibres, or furring it up.

The silk yarn employed by the weavers for the woof or weft of the stuffs they fabricate is composed of two or more threads of the raw silk, and undergoes a slight twisting by a machine. In the weaving of silk stockings, the thread employed is of the same kind, but contains a greater number of the single threads, according to the strength and quality of the work.

Organzine Silk is composed of two, three, or four threads of raw silk united, by first twisting separately each component thread in a mill, in a right-handed direction; and then, by a subsequent operation, twisting the two threads together in a contrary direction. In this manner, the fibres, which compose a thread of any requisite thickness, are combined in the strongest manner, precisely the same as in rope-making. It is of this description of silk that the warps of stuffs are made; and as but few of the principal articles can be made without it, it is a manufacture of considerable importance, both as regards its extensiveness, and the quality of the work. Formerly we imported the article from Italy, where for a long period the art of throwing the silk was kept a profound secret. For the introduction of the manufacture into this country we are indebted to the enterprise and skill of a Mr. Thomas Lombe, who, at the risk of his life, took a plan of one of these complicated machines in the dominions of the King of Sardinia, and on his return to England in 1718, by dint of great perseverance and ingenuity, established similar mills at Derby. In return for this important national service, he received the honour of knighthood, and had the sum of £14,000 granted to him by Parliament. Similar mills were, in course of time, erected in different parts of the country.

The following distinct operations are performed in bringing the raw silk into the state of organzine.—The raw silk is first wound from the skein upon bobbins in the winding machines. It is next sorted into the various qualities, then spun or twisted in a mill by the single thread, with the twist in the direction of from right to left, and very tight. The threads thus spun are next doubled, or drawn together between the fingers of a woman, who at the same time cleans them, by taking out the "slubs," which may have been left in the silk by the negligence of the foreign reeler. In the next process it is thrown by a mill, that is, the two threads are twisted together, either slack or hard, as may be required for the article to be manufactured, with the twist in a reverse direction to the first; and at the same time it is wound in skeins upon a reel. The skeins are then sorted according to their several degrees of fineness, which completes the process.

[*The Subject to be continued.*]

MR. WILLOUGHBY'S PATENT ACCELERATING IMPROVEMENT IN NAVAL ARCHITECTURE.

(Continued from Page 218, No. 14.)

[In resuming our account of this excellent invention, we feel it due to our readers to mention, that the non-appearance of the promised continuation of the subject in our last, was in consequence of the manuscript having been mislaid, when the number was going to press.]

In addition to the striking advantages we have already mentioned as resulting from the adoption of the patent iron ballast keels, being suspended below the bottoms of sailing vessels, should be noticed the important effect that will be gained by the suspenders themselves, if constructed of considerable breadth, as shewn in the engravings, fig. 1 and 4, (page 218) or even much greater breadth; for by that means they would answer most effectively the purpose of lee-boards. The powerful lateral resistance and support vessels might thus obtain would enable them to carry an increased quantity of canvas with security, and by the accumulation of power, their motion through the water would be accelerated in proportion.

It will be observed that the ballast keel in fig. 1 is prolonged in front of the suspenders, so that when drawn up to fit from stem to stern the bottoms of the vessels; by which, in case of meeting with sand banks, or a hidden rock, placed in the position shewn in the engraving, a vessel sailing with velocity, might be enabled to slide or forge over them, or at worst raise herself gently upon them, till she be a-ground; when she could instantly drop all sail, wind up her ballast keel, and be warped off.

In fig. 4, the ballast keel in front of the suspenders is cut off; which is for the purpose of preventing the vessel from being impeded by collections of sea weeds: this form of keel would therefore be preferable for vessels intended to navigate those seas or situations where the weeds occur in quantities.

Mr. Willoughby considers (in our opinion very justly) that his invention is peculiarly applicable to steam packets, which he says will enable them "to plough with safety the main ocean, and stem the rage of the boisterous waves; whilst at the same time, by occasionally drawing up their artificial ballast keels, they may be enabled to enter every port at ebb-tides affording water for the least navigation." This last idea alone for practical seamen, must appear to be an improvement of the very first importance, particularly during the winter months, in our northern latitudes, as it may frequently permit vessels to run into a port, near the close of day, instead of being kept out at sea, to rough the tempestuous weather of a long and stormy night, so liable to shipwrecks on a lee-shore, and other unavoidable misfortunes.

In common sailing vessels, it is proposed to draw up the ballast keels by manual labour, applied to the simple machinery as beforementioned; in steam packets the engine may be made to perform

this operation at pleasure, instantaneously, and with the utmost facility; " and it fortunately happens (as our ingenious author remarks) that *at the very period* when it may be necessary to check the course of a vessel on entering a river, or approaching danger; *the superfluous power of the engine might be applied to this purpose.*"

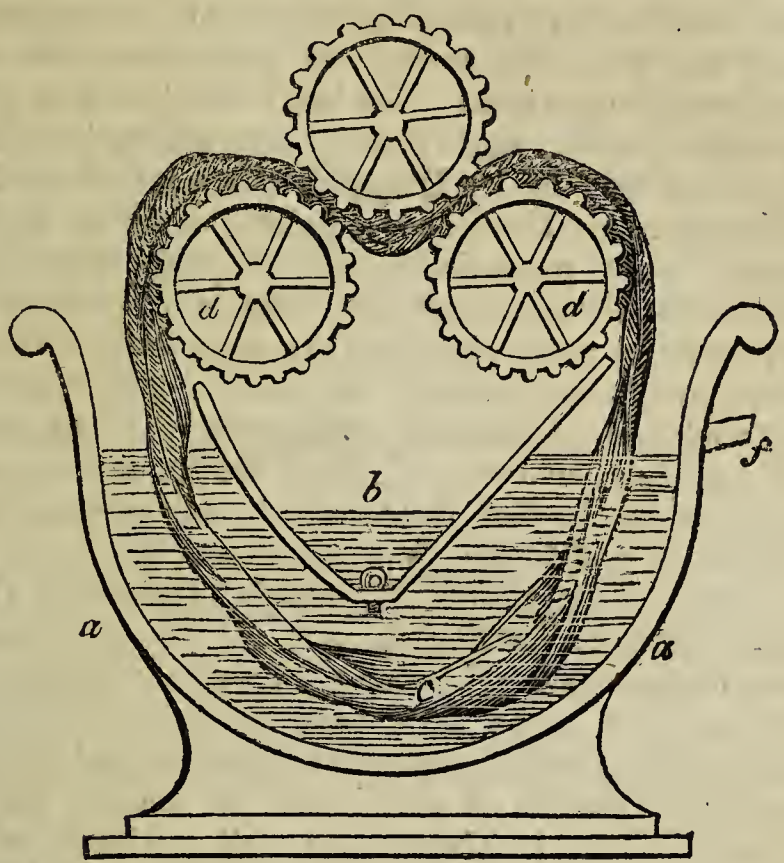
Fig. 3. is in elucidation of another very important improvement, which consists in connecting the ballast keel with the sides of the vessel by means of four flat iron guys; two on each side, running diagonally from the keel, and secured above by the chains, so that, in case of a sudden squall or gust of wind, its whole force would be at the same instant communicated from the sails, through the shrouds, chains and guys, to the proper counterpoise, the ballast keel itself, without its violent and sometimes fatal effects being felt by the hull in the smallest degree. The four guys are to be constructed " partly in joints, so as to fit the sides of the vessel, and for the purpose of being flexible when the keel is being drawn up."

It is recommended that the " stern and bows of the vessel be formed in a very oblique position, so as to make an acute angle with the surface of the water, in such a manner, that with a great velocity, she might be enabled to skim or *fly over the face of the sea*, without, as is usually the custom, having to *plough her dead way through it.*"

Our narrow limits prevent our going more into the detail of this interesting and truly valuable invention; however, we think it must appear evident from our brief account, that vessels built upon Mr. Willoughby's plan have not half the resistance to overcome in their passage through the water, when compared with those of the ordinary construction; and, as by this novel and truly scientific manner of placing the ballast, an efficient counterpoise is produced, which enables them to carry double the quantity of sail, their velocity must be increased *four-fold.*—Scepticism itself must allow it to be double —take it at that, and look at the immense advantages that must accrue to commerce, and the comforts and happiness of millions that depend upon it! If a voyage can be performed in half the usual space of time, only half the dangers (upon an average) will have to be incurred—thousands therefore may enjoy life, who, without this fine invention, would have met with a premature grave in the trackless deep.

An Improved Anchor Launch, or Boat, for large ships, has recently been invented. In the middle of the boat a bottomless well hole is constructed in the form of a cross, of suitable dimensions, to admit the flukes of the anchor (when in an upright position) down one of the arms of the cross, and the stock of the anchor down the other. In order to send out and drop an anchor, it is lowered down into the well-crop of the boat from the bow of the ship, and, thus suspended to the boat, it is secured by lashing, so that it may be cut away and dropped at the instant it is required. Previous to lowering the anchor from the ship into the boat, the cable is slackened out,

and drawn up through the well hole; the anchor being then placed as before mentioned, the cable is fastened to the ring of it, in such manner as to be clear of the boat when the anchor falls. Several of these anchor launches are at present in use in the Navy.



SECTION OF MR. FLINT'S PATENT WASHING MACHINE.

The above machine is for the purpose of cleansing woollen cloths from dirt, and their excess of colouring matter, after they have been manufactured. The construction is extremely simple, and may be perfectly understood by a glance at the above engraving.

a a is the section of a water trough, filled with water up to the pipe *f*, by which it is supplied; *b* is an inner vessel, for receiving the dirt and colouring matter as it falls from the cloth between the two cylinders *d d*, when pressed by the action of the upper cylinder. These cylinders are made of wood, with reeds or flutes along their peripheries, and revolve upon their axles in bearings fixed in the sides of the trough (which cannot be shewn in this sectional view.) The cloth *c* is put over the two lower cylinders, as a round towel, in an endless coil; the cylinders are put in motion by means of cog-wheels, or by band and drum-wheels fixed at either end of the trough, and actuated by any first mover of sufficient power. The cloth is by these means gently pressed between the flutes and ribs of the revolving cylinders passing through the soapy water below in easy folds, while the extraneous colouring matter and dirt is pressed out, and falls into the inner vessel, preserving the water in the outer vessel from a great portion of the foulness which it would otherwise soon acquire.

REVOLUTION IN PHILOSOPHY.

"Sir Richard Phillips continues to assail the foundations of the prevailing doctrines of causation, and is raising a new system into notice, which he considers more accordant with the majesty and simplicity of nature, than the system of gratuitous and miraculous causes which have long existed. He has developed this system in a volume of Twelve Essays, and recently and briefly in Four Popular Dialogues between one of its Disciples and an Oxford Tutor. Of course new doctrines on fundamental points, have to encounter authoritative and vulgar prejudices, both of pride and education.—Their general adoption can result only from a change in the generation; and, usually, such changes take place only after two generations. The extended influence of the press ought, however, if the system merit adoption, to accelerate these results; and, with a view to its speedy adoption, or total rejection, we submit to our readers a brief analysis of its leading features.—1. All material phenomena are effects of Matter in Motion, and there are no special principles of causation, such as Attraction, Repulsion, Universal Gravitation, Caloric, Light, Acidity, Vitality, &c.—2. The special causes of particular phenomena are special motions of various atoms and aggregates, which in most cases have been traced.—3. All Force and Power is the product of some matter and some motion conjoined; and all phenomena being results of some force or power, so all phenomena result from Matter in Motion.—4. All qualities are so many phenomena of atoms as agents and patients.—5. All Electrical powers are results of the correlative powers of separated atoms in definitive space.—6. All Gas arises from atoms performing circular orbits, greater or less, as the original excitement.—7. All Heat arises from atoms, which were in motion, parting with their motion; the power of heat arises therefore from atoms in motion.—8. Animals derive their heat and energy by fixing gas in the act of respiration.—9. Gravitation, or the weight of bodies, arises from the two-fold motions of a planet, which motions produce the aggregation of its mass. It is, therefore, a local effect in each planet.—10. There being no Universal Gravitation, there is no occasion for planetary Projectile Force.—All space is filled with gas; and as motions transmitted through gases or fluids diverge, or radiate, so all planetary bodies in motion affect one another inversely as the squares of their distances.—12. The Sun is at once the source of motion and delight, and heat in the solar system, and its motion transmitted through the gazeous medium filling space, affect all the planets inversely as the squares of their distances, and as their quantities of matter.—13. Action and re-action are equal, consequently motion or power is never lost, but is in a condition of continual transfer.—14. The action and re-action of the earth and moon have greater effect on the solid parts than on the moving fluids; consequently, these rise towards the fulcrum, or centre of action and re-action, which is always in the right line that joins the centres of the earth and moon, and hence the connection of the moon with the tides.—15. Other phenomena of

attraction, repulsion, affinity, &c. are explained and illustrated, by examining the circumstances of gazeous action and re-action, in which the affected bodies are placed.—16. There are no Electrical, Galvanic, and Magnetic fluids; but the whole of these phenomena are accounted for, by considering the correlative action and re-action of different atoms specially excited and placed in certain relations to other bodies.—Of course, from such general principles flow innumerable corollaries relative to the special causes of particular phenomena; but all these cases have been fairly met, and a system of causation, as simple as universal, is attempted to be established by Sir Richard Phillips, in accordance with our best views of sublime and eternal Omniscience and Omnipotence."—*Weekly Paper.*

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I DO not know whether the subject to which I wish to point your attention will be considered by you as coming within the object of your publication; but as it involves a case of distress to a portion of *our fellow creatures*, through the defectiveness of a work of human ingenuity, I take leave to submit it.

"I allude to the practice prevalent among carters of leaving their horses *muzzled* with their corn bags, which I conceive to be a most intolerable shame, and most hurtful to the poor animals who are the suffering subjects of such extreme laziness, by the check it must give to free and natural respiration. I would propose to obviate this by attaching upon the corn bags short, open nozzles, through which the air might be admitted, and placing them perpendicularly just so far above the provender as to prevent it overflowing by the movement of the horse's jaws. I think, sir, this subject, though apparently one of little science, is deservingly worthy of the consideration of those whose object is the easement and convenience of creatures, to whose services mankind are so much indebted.

"I am, &c.

"B. L. W."

NEW SELF-GIVING INK PEN.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"MR. EDITOR,

"IF you think the enclosed model of a 'Self-giving 'Ink Pen,' worthy a place in your excellent Miscellaneous Work, it is at your service. The Pen is made of two quills; the top one, which I shall call No. 1, and the other No. 2. When you have ready both quills like the model, taking care that the top of No. 1. be made air-tight, (which I do by dropping a small piece of cobbler's wax at the bottom, and then warm it a little) fill it nearly with ink, say about a quarter of an inch from the brim, take a small piece of cambric or muslin, (cambric answers the best) cover the top with it so that the

ink may not drop out, join both quills together, by putting No. 1. into No. 2. and the pen is ready for use. When you want to write take the pen in your right hand, give a gentle shock on your left hand, or on a table, and the ink will run down immediately into the pen; this must be repeated every time ink is wanted. By way of experience I am convinced that this very cheap 'Self-giving Ink Pen,' or whatever you may choose to call it, is extremely useful for reporters and persons going into the country, and also to many others, who I am sure will take delight in making use of it. The Pen should be put in a little case to carry about.

"I am, Mr. Editor,

"83, *Berwick-street, Soho,* "Your obedient Servant,

"*May* 12*th*, 1824. "E. D. B."

P. S.—The Pen is ready for use.

[With the above communication we received a Pen constructed upon the plan described by our ingenious Correspondent, and find it to answer *extremely well.* Ed.]

MISCELLANEOUS & SCIENTIFIC INTELLIGENCE.

Rectification of the Compass.—The Board of Longitude have voted the sum of £500 to Mr. Peter Barlow, for his simple invention for correcting the local attraction of ships. It consists of a plate of iron, abaft the compass, which being regulated so as to correct the effects of the ship in any one place, does the same in all places. This mode of avoiding error must be of incalculable advantage to navigation.

Steam Navigation in the East Indies.—A steam boat, named the Diana, built in Mr. Kyd's Yard, at Kidderpore, near Calcutta, was launched on the 12th. of July last, and on the same day made on the majestic Ganges, the first trip ever performed in India, by the aid of steam, between Calcutta and Chinsurah; which she successfully and most pleasantly performed in six hours and a half.

Dry Rot.—As this destructive evil generally originates in the underground apartments, it is recommended in lime-washing the walls of cellars and other under-ground apartments, to mix with the lime or whiting, a sufficient quantity of copperas to give it a yellow hue, which should be repeated every year. This simple application is said to be effectual not only in preventing the Dry Rot, but likewise, in arresting its progress when it has begun. While this operation is going forward, it would perhaps be as well to extend the colouring to the beams, joists, flooring, &c.

Damp Walls.—A very effectual mode of removing the inconvenience and unsightlyness of damp walls in dwelling rooms, is by lining the parts with very thin sheet lead, similar to that used in tea chests, and then cover it with the paper hanging. We are not sure, whether there is not a patent for this invention.

New Ferry Boat.—A very singular Ferry Boat is employed at Troy, in Canada. A platform covers a wide flat boat; underneath the platform there is a large horizontal solid wheel, which extends to the sides of the boat, and there the platform on deck is cut through and removed, so as to allow sufficient room for two horses to stand on the flat surface of the wheel, one horse on each side, and parallel to the gun-whale of the boat. The horses are harnessed in the usual manner of teams, the whiffle-trees being attached to stout iron bars, fixed horizontally at a proper height, into posts, which are a part of the fixed portion of the boat. The horses look in opposite directions, one to the bow and the other to the stern; their feet take hold of channels or grooves cut in the wheels, in the direction of radii; they press forward, and, although they advance not, their feet cause the horizontal wheel to revolve, in a reverse direction to that of their own apparent motion; this, by a connexion of cogs, moves two vertical paddle wheels, one on each wing of the boat, and propel the boat forward.

The Chemical Action of Capillary Tubes.—M. Dobereiner is of opinion that chemical combinations and decombinations may be effected by simple capillarity, and he succeeded in *producing sugar* by uniting the carbonic acid and carbonated hydrogen by the aid of charcoal and compression. Experiments of this kind are very dangerous. A strong tube of copper filled with charcoal, and in which he had introduced two gases by compression burst with a tremendous explosion.

Existence of Alcohol in Pyrolignous Acid.—In examining the pyrolignous acid obtained from birch the same chemist found alcohol in it. Some time after, a manufacturer of salts wrote him from Moscow, that in rectifying wood vinegar, he had collected about a third of brandy. In dissolving large masses of lead in wood vinegar, alcoholic vapours have been observed in such quantities as to deserve being condensed and collected.

Flame of Hydrogen rendered Luminous.—Dr. Hare, of Philadelphia, has rendered the flame of hydrogen luminous, like that of oil, by adding a small quantity of oil of turpentine to the usual mixture for generating that gas. The light seems greater than that of carburetted hydrogen. He found also that the addition of 1-17th of oil of turpentine to alcohol gives this fluid the property of burning with a highly luminous flame, and there is a certain point in the proportions when the mixture burns without smoke like a gas light.

Bleeding by the Leech.—We understand it is the practice of some surgeons, when leeches have been scarce, and it has been considered requisite to take a large quantity of blood from a patient, to cut off the tail of the leech, when it has nearly filled itself; the creature keeps on sucking to fill itself, and appears to be unconscious of its being employed merely as a funnel or a spout.

A Preparation of perfectly pure Gold for the gold wire and leaf manufacturers, and other uses, may be made by dissolving

ordinary fine gold, in thin plates or grains, in moderately strong nitric acid, into which muriate of soda is to be scattered at intervals, whilst a gentle heat is to be applied; sulphate of iron is then to be dissolved in cold water and filtered, as well as the solution of gold: then mix twelve parts of the former with one of the latter, and allow the mixture to rest for 24 hours, or more. The brownish precipitate is then to be boiled in a little pure nitric acid, and the gold washed with distilled water; finally, it is to be melted with a little pure nitre, and thus a perfectly pure fine gold may be easily and cheaply obtained.

Brass Ornaments that have not been gilt or lackered, may be cleaned, and a very brilliant colour given to them, by washing them with alum boiled in strong ley, in the proportion af an ounce to a pint, and afterwards rubbing them with fine tripoli.

[Our Correspondent "D. M." has sent us a second lot of recipes for insertion, from which we now select the following.]

"To Stain Picture Frames a good Black.—Boil chip log-wood in clear water, and while hot rub the frames over with it four times; scower them when dry, with sand-paper; then gi"e them two washes with tincture of steel, and lastly, rub them with a linen cloth and bees'-wax, which will make them of a beautiful black."

"To prepare Bird-lime for catching Birds, Mice, and other Vermin.—Boil holly bark in water for ten hours, when the green rind is separated, cover it up for a fortnight in a moist place. Afterwards reduce it into a tough paste in a mortar, and wash it in running water to get rid of the impurities; next allow it to ferment for five days, when the scum thrown upon the surface should be removed, and it is then fit for use."

Copper Sheathing of Ships.—In consequence of the rapid corrosion and decay of the copper on the bottoms of ships, in the royal navy, the Lords of the Admiralty have consulted Sir Humphrey Davy thereon, who, after a series of experiments, has recommended the fixing of small masses or wires of tin, or of some other readily oxidable metal, in contact with the Copper Sheathing, by which it is expected that the copper will be rendered so negatively electrical, that the sea water will act but slightly upon it.

Colouring Prints.—Persons who wish to colour prints should wash them first with alum water, which will prevent the colour from sinking, besides giving a lustre and brightness to them: for this purpose boil four ounces of alum in a quart of clear water, till the alum is dissolved.

Extraordinary Power possessed by the Walrus, of walking like the Fly, in an inverted Position.—A letter from Sir Edward Home has lately been read before the Royal Society, in which, among other curious discoveries, he states that the Walrus is provided with means similar to those of the Fly, which enables it to walk in an inverted position. In the Philosop. Trans. for 1816, the structure of the feet of the Fly is described—and on seeing a muti-

lated foot of the Walrus, Sir Everard was struck with the resemblance between them. In consequence of this similarity, Captain Sabine, who commanded one of the ships in the late North Polar Expedition, was requested to bring home a specimen of this remarkable animal, which he accomplished, with the aid of the assistant-surgeon of the ship. The hind feet were found to contain a hollow space, from which the animal could at pleasure expel the air, when it was placed on any surface; they were also provided with two toes, which enabled the creature to perfect the vacuum, by bringing the parts in closer contact with the surface on which the foot was placed, and which would admit the air on being raised. Upon examining the feet of the Fly, similar toes were observed; but it was not until an opportunity occurred of examining the same organs in the foot of a larger animal, that their use was fully developed. The foot of the Walrus required diminishing four times to exhibit its parts on a quarto plate; whereas that of the fly required magnifying one hundred times to render it distinctly visible.

Animal increase.—If all the ova of a herring were fecundated, eight years would be sufficient to make its posterity fill the whole ocean; for every oviparous fish contains thousands of ova, which it deposits in spawning time. If we suppose that the number of ova amounts to only 2,000, and that these produce as many fish, half males and half females, in the second year there would be more than 200,000; in the third, more than 200,000,000; in the fourth, more than 200,000,000,000; and by the eighth year, the number would exceed that expressed by 2 followed by twenty-four ciphers. Now, as the earth contains scarcely so many cubic inches, it follows, that if the whole space of our globe was filled with water, it could not contain all these herrings!

Domestic Economy.—The shavings of ivory, which may be procured of any ivory turner, when boiled in water, form a strong and excellent jelly, equal in every respect to hartshorn jelly. Should the sending to a turner be inconvenient or impracticable, any piece of ivory that may be at hand will answer the purpose by scraping it with a knife; such an expedient might be of great service to the sick at times, particularly as the restorative virtues of ivory jelly are very great, and its flavour agreeable.

To destroy Flies without the use of a poisonous Mixture.—Take half a tea-spoonful of black pepper, one tea-spoonful of brown sugar, and one table-spoonful of cream, put the mixture in a plate or saucer, and set in the room where the flies are troublesome, and they will soon disappear.

Preservation of Eggs.—As it is of great importance in a zoological, and to a certain extent even in an economical view, to be able to transport eggs fresh from one country to another, it has been proposed, as the best mode of effecting this to varnish them with gum arabic, and then imbed them in pounded charcoal. The gum arabic answers better than varnish, as it can be easily removed by washing

in water, and the bed of charcoal, by maintaining around the eggs a pretty uniform temperature, prevents them from suffering from the great alternations of heat and cold experienced in carrying them to different countries.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

PREVENTING THE DESTRUCTIVE EFFECTS FROM MOTHS.—To the person who shall discover to the Society a cheap, easy, and effectual mode, verified by repeated trials, of preventing the destructive effects by moths and other insects, in furs, woollens, and other articles, superior to any hitherto in use. The Gold Medal, or Thirty Guineas.

ORGANZINE SILK.—To the person who shall invent and produce to the Society a method by which to organzine silk equal in quality to the Italian throw, at an expence not more than two thirds of the current price of throwing. The Gold Medal, or Fifty Guineas.

PREVENTING EXPLOSIONS IN STEAM ENGINE AND OTHER CLOSED BOILERS.—To the person who shall invent and discover to the Society a method of rendering closed boilers used for Steam Engines and other purposes, safer than any now in use, and less liable to accidents from explosion. The Gold Medal, and not less than Thirty Guineas.

OIL FOR CHRONOMETERS.—To the person who shall invent and discover to the Society a method verified by actual experiment, of rendering oil more fit than any now in use for chronometers and watches, particularly in being less liable to become thick or rancid. The Gold Medal, or Fifty Guineas.

RECENT PATENTS.

To EDWARD JORDAN, of Norwich, for certain improvements in the construction of water closets. 27th March. Six months.

To JOSEPH SPENCER, of Belpar, Derbyshire, for his invention of certain improvements in the construction of furnaces and forges for the preparation of iron or steel, and for the process of manufacturing nails and other articles from the said materials. 7th April. Six Months.

To THOMAS RYALLS, of Sheffield, Yorkshire, for his invention of an apparatus for shaving, which he denominates the useful and elegant facilitator. 8th April. Two Months.

To DAVID GORDON, Esq. of Basinghall-street, London, for his invention of certain improvements in the construction of portable gas lamps. 14th April. Six Months.

TO OUR READERS AND CORRESPONDENTS.

Our Correspondent Mechanicas's two letters are before us. It is not in our power at present to go more into the detail of the subject to which his questions relate, but we will endeavour to give the matter our earliest attention.

In reply to Mr. Stirling's inquiry, we cannot inform him who is the mafacturer of the machine, but as its construction is very simple, it must be in the power of almost any workman to make one.

P. W's. communication on the uses of carbonic acid gas, we will endeavour to make room for in our next; but its great length will render some curtailment necessary.

We presume that our Correspondent W. A. who inquires into the best mode of boring the earth for water, cannot have read our No. 13 of the Register, which contains not only an account of the usual manner it is performed, but likewise some very important improvements.

H. H.'s account of his mechanical invention will not be understood, we fear, without the aid of drawings. If he calls at our Publisher's, some arrangement may be made for assisting him in that respect.

Mr. E. Carey's communication came too late for insertion in the present number, but will appear in our next.

[*To be continued every* Fortnight.]

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REGISTER

OF

THE ARTS AND SCIENCES,

IMPROVEMENTS & DISCOVERIES.

No. 17.] SATURDAY, MAY 29, 1824. [Price 3*d*.

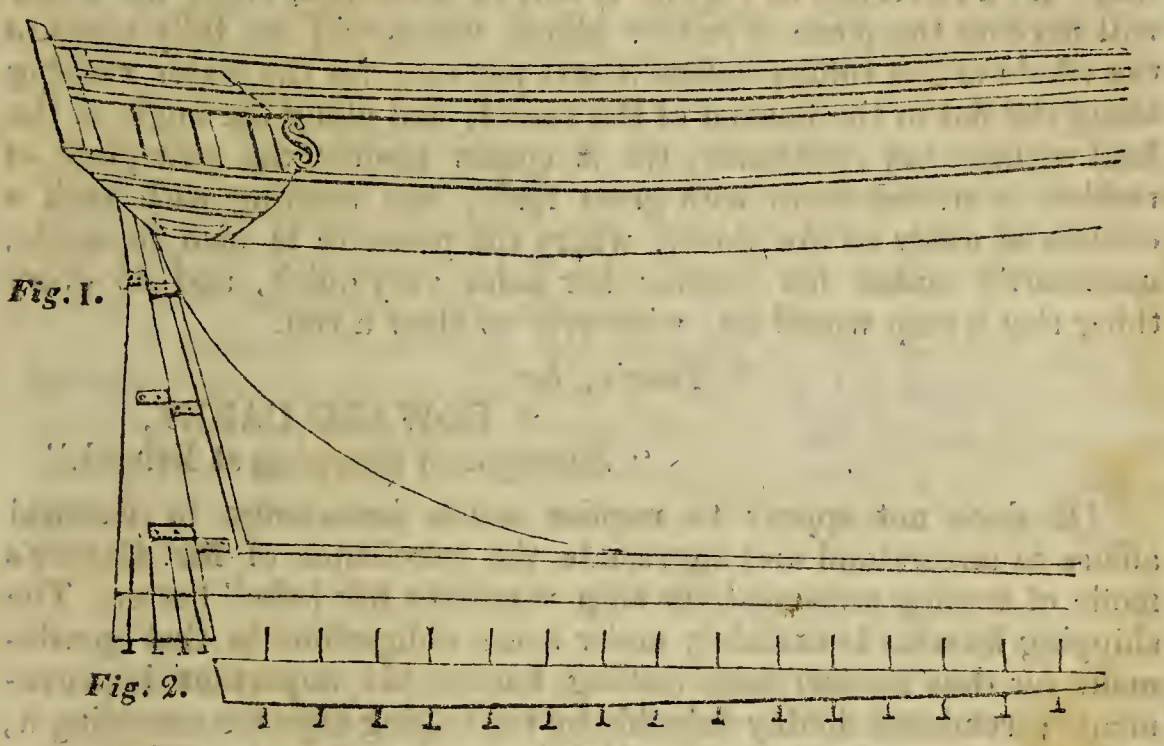

Fig. I.

Fig. 2.

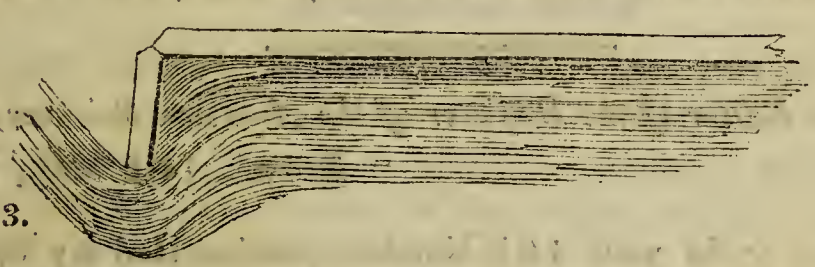

Fig. 3.

" MR. EDWARD CAREY'S PLAN,

FOR MAKING A SHIP STEER EASY THAT HAS A FULL BUTTOCK, AND THAT WILL NOT ANSWER HER HELM, AND FOR MAKING HER HOLD A GOOD WIND, WHICH EXPERIENCE HAS PROVED TO BE THE DESIDERATUM WANTED."

" *To the Editor of the Register of the Arts and Sciences, &c.*

" SIR,

" As the improvement which I have now to offer to your notice is of the utmost importance to ship owners, whose vessels for want of a longer run, and being very full, will not steer : be pleased to give the annexed account of it insertion in your useful REGISTER.

" In all ships that have a full buttock, it has been the plan to bolt on a false post and make the rudder broader ; the advantage thus gained in steering is extremely slight, as long experience has

proved. It is therefore with much satisfaction that I am enabled to lay before the public a most effectual remedy for vessels having the defect already mentioned;—which is, to bolt a piece on the keel one foot six inches aft, running its breadth two-thirds forward, then tapered off to nothing as far as the gripe, or to any breadth, and to bolt another piece of equal breadth on to the bottom of the rudder, (as shewn in the above drawing, Figs. 1 and 2,) which *will make the ship hold a better wind, answer her helm quickly, and steer perfectly easy.* By a reference to Fig. 3, it will be seen what effect the water will have on the piece of rudder added, which will be fully equal to the whole of the rudder before it was put on; for the water rushing along the flat of the bottom of the vessel, and along the angle of the keel without any resistance, till it comes against the new piece of rudder, it strikes there with great force, and meeting with such a column of water so low down, where the pressure is also immense, necessarily makes her answer her helm very quick, and do every thing that a ship would do, with ever so clear a run.

"Your's, &c.

"EDWARD CAREY,

"Surveyor of Shipping at Bristol."

[It does not appear to require much knowledge in nautical affairs to understand and appreciate the excellence of Mr. Carey's mode of making a round-built ship "answer her helm" better. The shipping interest is certainly under some obligations to that gentleman, for thus unreservedly making known his important improvements; rendered doubly valuable by the trifling expense attending it, and the extreme facility with which it may be effected. Ed.]

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Bristol, 14th May, 1824.

"Sir,

"In your 14th Number you inserted my opinion of the best mode of Coppering Ships, but I omitted two very essential points. The first was, after the seam was well caulked and payed, to fill the seam with spun-yarn *(twice laid will do)*; this should be beat in, and nailed there, in order to make a smooth surface for laying on the copper. Let no paper be put under the copper—I consider this a useless expense. When your ship has worn out the first and second coppering, then sheath her with one inch (never thicker) sheathing, after searching her bottom, and giving it a good caulking: under your sheathing put the patent felt; or, if this cannot be got, very thick paper well soaked in tar, and tacked on the bottom. Then take a great deal of pains in putting on the sheathing;—let every strake be *spiled** for the same as if you were planking her bottom, let the sheathing be nailed with copper nails,

* Measuring and taking an exact account of the board, so they may lie easy and fit close on the bottom against the plank.

and then copper over the sheathing. A ship done carefully in this way, will run with the greatest safety for twelve or fourteen years, and be all the time as tight as a cask, without any thing wanting to be done to the bottom, except fresh coppering. What a saving might thus be made to ship owners!

"Experience, that touch-stone of truth, has convinced me of this assertion: a vessel called the Snipe, had her copper taken off the other day, under my inspection; she had, ten years before, been sheathed with wood, with the patent felt under, and had not made a drop of water during that period of time. When the copper was taken off, the sheathing appeared remarkably good; but being on ten long years, the owner thought it prudent to take it off, to examine the seams, being apprehensive the oakum might be rotten; but to our astonishment, we found the bottom, under the felt, as dry as possible, the oakum as sound and good as ever, and positively it was a pity it was disturbed at all; and I am really of opinion it would have lasted ten years longer.

"I purpose continuing my remarks on the present mode of building and repairing our men of war, in his Majesty's yards, pointing out the destructive system they are still pursuing, and will clearly shew that they are totally wrong; to which I will annex my plan for preserving our men of war serviceable, for at least twenty or thirty years.

"I am, Sir, Your very humble servant,

"EDWARD CAREY,

"Surveyor and Inspector of Shipping at Bristol, and late Master "Shipwright at H. M. Naval-yard at Gibraltar."

FRENCH MODE OF RENDERING LEATHER, CANVAS, LINEN, &c. WATER-PROOF.

The following substances are first well ground and mixed together, viz. 1½lb. of the acetate of lead (sugar of lead), and 1½lb. of very finely powdered pumice stone; these are then boiled in 100 gallons of the best linseed oil, over a gentle fire, that the oil may not be burned. The liquid should be kept boiling, until it becomes of such a consistence, that after being mixed with a third part of its weight of pipe clay, it should be of the thickness of molasses. It is then left to clear itself, and afterwards passed through a fine lawn sieve. About 10 pounds of pipe clay is then to be ground with a solution of the best glue, and so mixed as to be of the consistence of lard; to this mixture is to be added the varnish by degrees, mixing, and stirring it well, at every addition, with a spatula of wood, until it has become perfectly fluid. The colour is then added, consisting of 1¼lb. of calcined umber, and 1½lb. of white lead ground in oil. In order to apply it, the linen is stretched over a frame of wood, and the composition spread by means of a broad spatula, about 3 inches wide and 9 inches long. The frame is then inverted and the composition applied on the other side of the cloth;

it is allowed to remain for a week on the frame to dry, and then taken off for use. The cloth so prepared is used for riding cloaks, and as covers for carriages, &c.

The same composition is applied to leather and skins, but to produce a glossy brilliant appearance, a varnish is employed, consisting of 5lb. of the oil varnish, as before mentioned, and an equal weight of clear resin, heated together over a fire until the resin is dissolved; to these are added 2lbs. of oil of turpentine, with which has been ground some colour, to give it the required tint, and cleared of all impurities by passing through a fine lawn sieve. This varnish is laid on with a brush, and when quite hard is rubbed over with pumice stone and water, and afterwards well washed. Two or three coats of this varnish are given to it, each coat being well dried before another is laid on, by which is produced a varnish of such brilliancy as to rival the best japan.

[As the following letter has somewhat of an official air, we would wish to call the attention of our readers to it, as it goes to remove an impression which we believe generally prevails, of interest to be made, and difficulties to be surmounted, by candidates, in submitting their inventions to the Society.]

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"IN the course of communication with some operative mechanics, I have been surprized to find a notion prevailing, that considerable interest is requisite to procure the admission of inventions to be submitted to the consideration of the Society of Arts. I think you might do an essential service to this class of persons if you were to inform your readers, that no interest or patronage whatever is necessary, and that all that is required of a candidate is that he send a letter, addressed to the Secretary, A. Aikin, Esq. Adelphi, announcing the subject, which letter should be accompanied by a model or description of the invention; but this is not absolutely necessary, the candidate may state, that when called upon he will be prepared to wait upon the Society to produce his invention. In due time a letter is written to the candidate, announcing that his invention has been referred to a Committee, and informing him at what time it will be taken into consideration. The Society is open at all times to receive inventions, but they can only be considered during the session, which commences early in November and concludes on the second Wednesday in June. It may be useful to add, that the Lists of Premiums are published early in June of each year, and that they may be had gratis at the house of the Society, on application to the porter, between the hours of ten and two.

"Your obedient servant,

"A MEMBER OF THE SOCIETY OF ARTS."

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I APPEAL to your justice in favour of an ingenious man, who has been wronged by your correspondent E. D. B., in your last Number. E. D. B. has furnished you with an account of a Fountain Pen, or, as he calls it, "a Self-giving Ink Pen," the inventor of which is a Mr. Stass, and it forms part of a recent communication made by him to the Society of Arts; but from the tenor of E. D. B.'s letter, he would take the credit of the invention to himself. Yet, to those who are acquainted with the subject, he betrays his ignorance of half the merits of the invention.—Mr. Stass deservedly claims the credit of having been the first to form a Fountain Pen from materials always at hand, at the expense only of two quills, and requiring no more ingenuity than is requisite to make a common pen. With these, in one minute, may be made an instrument superior to any known invention for a similar purpose.—E. D. B's dirty expedient of shoemaker's wax was never contemplated by Mr. Stass—to prevent the leakage of the quill (a defect generally found), it is only necessary to let fall a drop of burning sealing wax on the front where the shaft of the feather becomes quill. After the quill has been once filled with ink and the pen used, to replenish the reservoir, No. 1, it will not be necessary to remove the pen, No. 2, which slips over the bit of muslin, as described by E. D. B.; but if No. 2 be filled with ink from an inkstand, with a common pen, and No. 1 be pressed, the air within will be forced out, and on the removal of the pressure, the external air will drive in the ink—a few dips will thus refill the reservoir with a sufficient supply for writing a quire of paper; and if from careless pressure, or the warmth of the hand expanding the air within, No. 1 should fill too freely, it may be immediately absorbed by turning up the pen and pressing it; the air from within will bubble out, and on the relief from pressure, the excess will return to the reservoir. Bramah's pens may be employed in these Fountain Quills, if No. 2 be made merely a cylinder of quill, within which Bramah's pen formed of a bit of quill is placed, it will remain firm in its situation, and more readily removed and adjusted, than in Bramah's patent holder; or if No. 2 be too large to hold Bramah's pens, they may be fixed by putting a small cylinder of quill with the cylinder No. 2, and between them Bramah's pens may be fixed firmly;—but this expedient will be necessary, only when larger quills, such as swan's quills, are used for the reservoir. To reporters, collectors, and persons on a journey, this invention is most valuable. All the patented contrivances for the purpose are defective—this is complete; and instead of an expence of from 7s. to a guinea, is obtained at the cost of two quills, and if lost or broken, may be replaced immediately. They are cleaner than any other pens—never soiling the fingers, except in the hands of the very awkward and ignorant. In making Stass's Fountain Pen, one thing must be attended to—the removal of the greasiness on the inner surface of a new quill for No. 2; this prevents the ink, when pressed from No. 1, diffusing itself, and flowing freely to the nib of No. 2, it will ac-

cumulate in drops, and when their weight exceeds adhesion will fall. This greasiness may be removed by scraping lightly the inner surface, or washing it with any liquid which will remove grease. I have to beg your pardon for making this communication so long; but I was anxious at once to be explicit, and to do justice to an ingenious man, whose invention has been taken, without acknowledgment, by E. D. B. "I am, Sir,

"ONE OF YOUR EARLIEST SUBSCRIBERS."

VALUABLE TEST FOR ACIDS, ALKALIES, AND COMPOUND SALTS.

A FACT is noticed in the last volume (41) of the Transactions of the Society of Arts, which we thought we should have been the first to communicate to the public; which is, that of the infusion of red cabbage being a complete and elegant test for acids and alkalies. We were led to this discovery ourselves, by observing that some pearl-ash, which had accidentally fallen into a dish containing some red cabbage pickle, had turned the contents to a beautiful green; and considering that this new colour was first a purple, turned red by the action of the vinegar (or acetous acid) and afterwards to a green by the alkali, we were disposed to think that it might not only be rendered highly useful as a test paper, but possibly afford some valuable pigments, by separating the colouring matter from the fluid. With this view we set the matter by for future experiment. Mr. Griffiths, of Church Street, Kensington, it appears, has made the same discovery, and communicated it, together with the results of his experiments, to the Society of Arts, in the following Letter; for which he has received the merited thanks of that valuable institution.

"SIR,—"I REQUEST you will lay before the Society of Arts, &c. the inclosed specimen of test-paper, made from the infusion of red-cabbage, which paper is a test of the presence both of acids and alkalies; the former changing its blue colour red, the latter changing it green.

"The application of this paper to the purpose of the experimental chemist, I believe, will be found to possess a claim to originality. It is thus prepared:—Take one pound of the minced leaves of the red cabbage, and boil the same with a pint of distilled water, till all the blue colour is extracted. The liquor is then to be strained through a cloth or sieve; and the clear infusion, which is of a fine blue colour, is to be evaporated to half its bulk, and poured into a shallow dish: the paper may then be dipped into it, and hung on lines to dry. A sheet of the filtering paper, which is the paper used, absorbs two fluid ounces of the infusion.

"Metallic and other salts which, although they be neutral, give indications of alkali with turmeric paper, do not affect this paper as alkalies, but give indications of neutral or acid salts, as may be the case.

"The paper is reddened by the following acids:—Acetic, arsenic,

boracic, camphoric, carbonic, citric, malic, muriatic, nitric, oxalic, phosphoric, prussic, pyroligneous, sulphuric, sulphurous, tartaric, and all the acids that I have tried.

"It is turned green by the following alkaline substances:—Potash, soda, lime, baryta, strontia, magnesia, ammonia, carb. ammonia, carb. potash, carb. soda, borax.

"The following substances give alkaline indications with turmeric paper, not being so:—Permuriate iron, protomuriate iron, pernitrate of iron, protonitrate iron, protosulphate iron, persulphate iron, sulphate zinc, muriate of tin, muriate of zinc, boracic acid.

"Corrosive sublimate reddens this paper, as also that from litmus.

"Acetate of lead turns this paper green as an alkali does, but there is no test paper with which it does not give indications of alkali.

"In alkalimetry *two* test papers are employed, litmus and turmeric, and two drops have to be taken repeatedly from the solution in order to try if it is acid or alkaline, and by taking away so many drops the result of the process is rendered fallacious.

"With my test-paper, one drop of the solution only is required, as it is a test both for acid and alkali. In many other processes of analysis, a test for acid and alkali at one operation, may probably be found advantageous. "THOMAS GRIFFITHS."

"9, *Church Street, Kensington.*

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"IN your last Number I observed an account of an improved Anchor Launch, for weighing an anchor at the midships, instead of the stern, as is usual.

"The advantages of equalizing the strain on the boat are manifest, and it was attempted some years ago in Indiamens' boats, by means of a windlass, and a trunk directly underneath it, only sufficiently large at the bottom to pass a rope, but broad at the top, to admit of shifting the rope on the windlass, or, to use a nautical term, *fluting over*. But as the anchor hung beneath the boat she rowed heavily, and with difficulty, and the first expedient not succeeding, the principle, as is too often the case, was neglected.

"The manner you have described reflects the utmost credit on the ingenious inventor; but one objection appears, for the arms of the cross would cut the boat nearly in halves. As to raise the anchor into the boat shears must be used with a tackle; I should propose that only a long narrow well be formed in the middle of the boat, lengthwise, and that when the anchor is lowered, or weighed, to first let the flukes go down the well, if lowering, then to twist it, so as to bring the stock lengthwise of the well. The lower block must be provided with a hook and swivel to prevent the fall of the tackle from twisting. "I remain, Sir,

"Your's, obediently,

"Rotherhithe-street, May 22, 1824. "A SHIPWRIGHT."

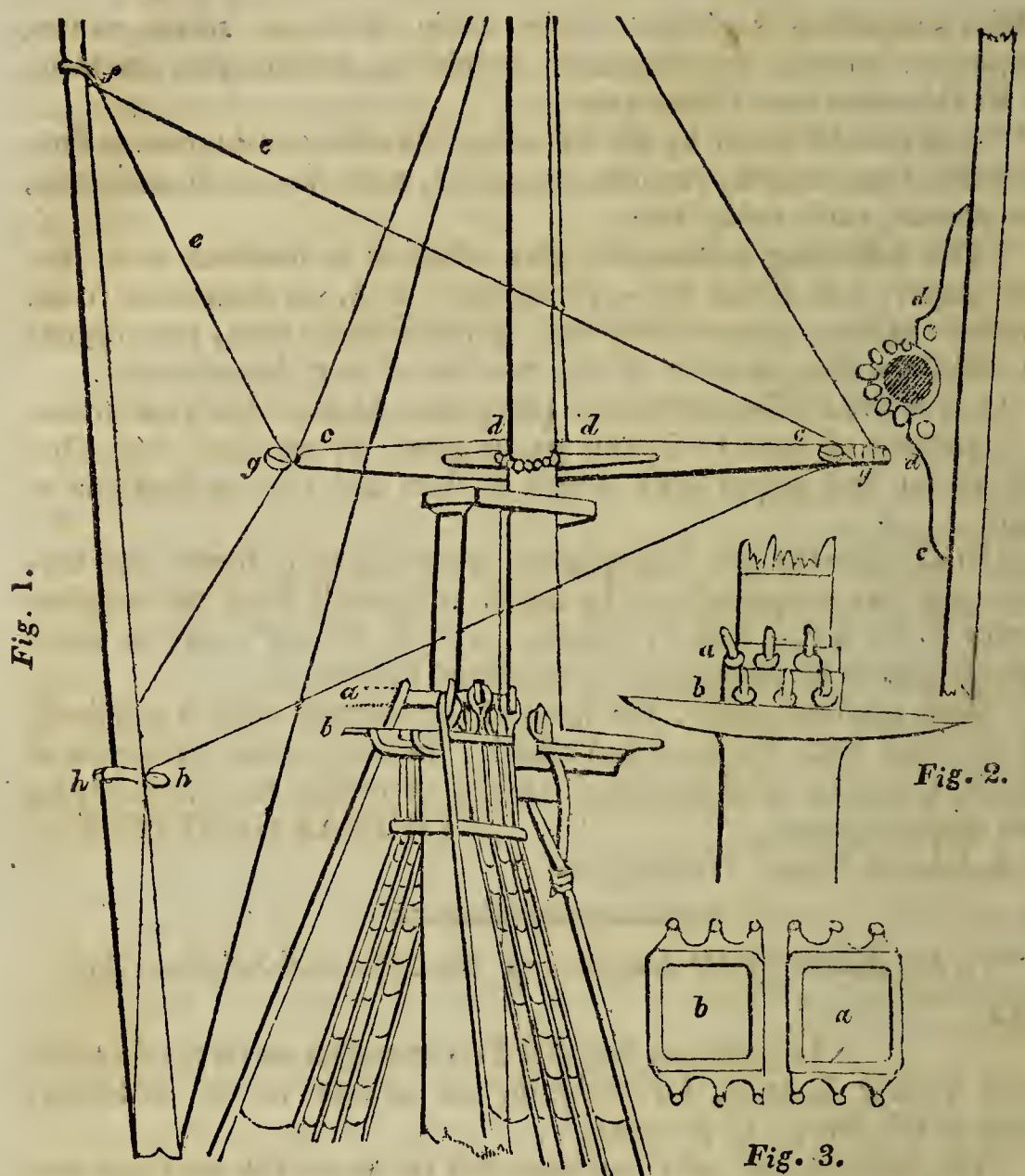

Fig. 1.

Fig. 4.

Fig. 2.

Fig. 3.

IMPROVEMENTS IN THE RIGGING OF SHIPS.

By Lieutenant W. P. Green, R. N.

The unfortunate issue of several naval actions with the Americans during the late war, in which British frigates were captured, first attracted Lieutenant Green's attention to the subject. In analyzing these, it appears that a principal cause of the success of the enemy was the rapidity with which he shot away the rigging, and consequently disabled the masts of his opponent.

The masts of ships are secured in two directions ; longitudinally by means of long ropes called stays, and in a transverse direction, by means of other ropes called shrouds, each of which has a loop in the middle which is passed over the head of the mast. Each pair of shrouds may therefore be considered as forming the sides of an isosceles triangle, of which, the apex is the mast head, and being in pairs, it necessarily follows, that if one is shot away, the opposite shroud becomes nearly useless. Lieut. Green, therefore, proposes, that the shrouds should be single, and that each should be terminated at

top in a strong iron hook, to take hold in an eye fixed in a strap or plate at the mast head.

Another improvement proposed by the same officer is in the method of slinging the topsail-yards, by fixing to the yard where it comes in contact with the mast, a kind of clasp or crutch, similar to that at present applied to the main-boom; which by half embracing the mast, serves to steady the yard, and to prevent those violent jerks, by which, in blowing weather, men are not unfrequently thrown from the yard into the sea; it has the farther advantage of saving the expense of rolling tackles, besides strengthening the yard in the slings and quarter.

During the last war, Lieut. Green commanded a brig-cutter, the two masts of which were secured and rigged in the usual way. He obtained leave to add, at his own expense, a small mizen mast, for the purpose of submitting his plan to actual experiment; the result of which, as far as it went, during the two years that the experiment lasted, was entirely to his satisfaction.—[*Trans. Society of Arts.*]

Reference to the Engraving.—Fig. 3, *a* and *b*, two square iron straps fitted on the mast head, one above the other; they have three hooks on each side of them to receive the tops of the shrouds; these above are placed so as to alternate with those below, as shewn, fig. 2, in order to give room for the eyes of the shrouds, and to let them come sufficiently close.

a, and *b*, fig. 1, shew the shrouds fixed on the hooks.

Fig. 1, *c*, *c*, the top-sail yard having chocks, *d*, *d*, to embrace the top-mast half round, and thereby prevent the yard swinging endways.

Fig. 4, shews a bird's-eye view of part of the yard *c*, *c*, and of chocks, *d*, *d*, embracing the mast.

Fig. 1, *e*, *e*, the braces of the top-sail yard; they are fixed at *f*, pass through the blocks at *g*, *g*, at the yard arms, then through the blocks *h*, *h*, and are secured at *i*.

THE PROCESSES OF STAINING WOOD, IN IMITATION OF THE FINER SORTS.

Artificial Ebony—is made by boiling smooth clean box in oil till it becomes perfectly black; or by washing pear-tree wood with aqua fortis, and drying it in a shady place in the open air; after which common writing ink should be repeatedly passed over it, and the wood dried in a similar manner, till it acquire a deep black colour. It may then be polished with wax and a woollen cloth, which will give it a fine lustre. A very fine black is also produced by a solution of copper in aqua fortis, and afterwards brushed over with a decoction of logwood.

Artificial Rosewood; may be admirably produced by brushing over the wood repeatedly a strong decoction of logwood, and allow it to dry; then with a piece of cane bruised very coarsely to be used

as a brush, apply a solution of copperas, or (that which is, perhaps, better) a solution of iron filings in vinegar, in such a manner as to produce an imitation of the grain of the wood.

Artificial Mahogany; a beautifully coloured wood in imitation of mahogany, may be obtained by heating over a fire, in a proper vessel, some dragons blood dissolved in oil of turpentine, in which is immersed some plane tree wood; a very rich and brilliant colour is thus soon obtained. This is the mode practised in Germany; but as the process must be attended with considerable danger from the liability of the oil of turpentine to take fire, we would recommend it, as worth the trial, to boil the wood well in simple water, then take it out, and whilst quite hot, brush over it repeatedly a solution of the dragon's blood in oil of turpentine.

Another preparation, for communicating a perfect mahogany colour wood to inferior woods, especially those of elm, maple, and sycamore, consists of the following ingredients:—dissolve two drachms of dragon's blood, one drachm of alkanet root, and half a drachm of aloe, in half a pint of rectified spirits of wine. Previously to using this tincture, the wood ought to be moistened with aqua-fortis; when two or three coats of the former, each being allowed to dry before the next is applied, will be sufficient to produce the desired effect. Another common method for imitating the colour of mahogany—is, by brushing over the wood, a strong decoction of madder and fustick (2 parts madder to 1 of fustick) made boiling hot.

To dye Wood a fine Yellow.—Dissolve gamboge in spirit of turpentine, and wash it over the wood—the colour is very lively and brilliant. If one part of dragon's blood be used, with two of gamboge, various shades will be communicated to the wood of the plane and the beech. The tincture of turmeric, made by digesting turmeric in spirit of wine, also answers extremely well.—The addition of dragon's blood gives an *orange* tint.

To dye Wood a fine Blue;—take two drachms of the best indigo reduced to a fine powder; put it in a glass with 2oz. of oil of vitriol, and agitate them with a new clay-pipe. After standing 10 or 12 hours, at the farthest, in a temperate place, pour it into a large glass or earthen vessel, and add such portion of pure water as may be expedient to give it the tint required. Those to whom the saving of time is an object, may purchase this staining liquor ready prepared, from the dyer. Another method of tinging wood blue, is that of dissolving verdigrise in distilled vinegar; then making a separate solution of 2 oz. of pure pearl-ashes in a pint of water: the former liquid should be first repeatedly applied to the surface of the wood till it be of a sufficiently deep green colour, when the latter preparation must be drawn over it, with a soft painter's brush, as often as may be necessary to change it to the proper blue cast.

To dye Wood a Green;—dissolve purified verdigrise in distilled vinegar, or in aqua-fortis diluted with 15 or 20 times its weight of water, and apply the solution to wood previously warmed.

To dye Wood a Purple ;—boil in a quart of water 2 oz. Brazil wood and 1 oz. logwood till one half is evaporated, strain it off, and lay on the coloured liquid with a painter's brush till a deep red tint is given ; when dry draw over it a weak solution of pearl-ash, made by dissolving a drachm of the alkali in a pint of water.

To dye Wood a Red ;—take 2 oz. of Brazil wood, and 2 drachms of purified pot-ash ; mix them with a quart of water, and infuse for 2 or 3 days ; then strain and make boiling hot, with which brush the wood until it is highly coloured, and while wet brush over a solution of alum (in the proportion of 2 oz. to a quart).

To dye Wood a Pink or Rose-red ;—add to the foregoing infusion of Brazil wood, a quarter of an ounce of pearl-ash, and use it as before, observing to brush the wood over often with alum water.

To render the stains of any of the foregoing more beautiful, a varnish may be spread over the work, of seed or shell lac. For coarser work, the varnish of resin and lac; or they may be well rubbed over with drying oil—or with a little bees wax, as the quality of the article may render it desirable.

THE ELEMENTS OF NATURAL PHILOSOPHY,

No. 11.—Hydraulics.

[*Continued from No.* 14, *page* 221.]

The *forcing pump* differs from the *sucking* and *lifting* pump in these particulars. It consists of a barrel and piston, or forcer ; there are also two fixed valves in it; one in some convenient part of the sucking pipe, and another in a pipe or tube which branches from the barrel, to which is attached a strong and capacious vessel, closed at the top by a small pipe that is fixed into it, and that reaches nearly to the bottom. The valve must of course be quite air-tight, and so disposed, as to let the water freely rise and have a passage, but absolutely to hinder its return.

When the piston is raised or moved upwards in the barrel, the air between that and the water below having room to dilate by its natural spring, will of course be rarified ; the pressure of the atmosphere being intercepted by the force of the barrel on one hand, and by the valve in the branching pipe on the other, the water will rise from the spring into the barrel for the reason already given ; and repeated strokes of the piston will fetch up the fluid to the forcer, and fill the cavity of the pipes between the fixed valves. The water in this manner raised being hindered from going down again by the lower valve, will be pressed by the forcer every time it descends, and be thereby obliged to make its way where there is least resistance, viz. through the valve in the branching pipe; and whenever on the rising of the forcer the pressure intermits this valve will immediately close under the weight of the upper water, and prevent its return that way, while the piston is rising with a fresh supply; and this is repeated at every stroke of the forcer.

It is evident, from what has before been advanced, that the operation of a pump must be by starts, and that the water in the main remains at rest, pressing on the valve during the time that the piston is withdrawn from the bottom of the working barrel. It is in most cases desirable to have this motion equable, and in some cases it is absolutely necessary. Thus in the engine for extinguishing fires the spout of water going by jerks could never be directed with a certain aim, and half of the water would be lost by the way; because a body at rest cannot in an instant be put in rapid motion; and the first portion of every jerk of water would have but a small velocity. To obviate this inconvenience, and procure a nearly equable stream of water, the vessel attached to the branching pipe was adopted. When the water is forced along the rising pipe, it gets into this vessel, and rises above the lower part of the pipe, which is inserted into it. The confined air which is above the water in the vessel being condensed into a smaller space by the admission of more water at each action of the piston, presses by its elasticity upon the surface of the water, which cannot return by the the valve in the pipe, and forces it up the pipe in a continued stream. This vessel must be so large that the change of bulk of the compressed air during the inaction of the forcer or piston may be inconsiderable, else the stream will not continue until the next stroke. We must not imagine that because the stream produced by the assistance of an air vessel is almost perfectly equable, and because as much water runs out during the returning of the piston as during its active stroke, that it *therefore* doubles the quantity of water: no more water can run out than that which is sent forward by the piston during its effective stroke. The continued stream is produced only by preventing the whole of this water from being discharged during this time, and by providing a propelling force to act during the piston's return. It is, however, a matter of fact, that a pump, furnished with an air vessel, delivers a little more water than it would do without it.

It is not to be supposed, that in a work like the present, a description of the great variety of combinations of these three pumps could be at all gone into, but we hope that the principle upon which they act, and which have been here detailed, will be sufficient to give a general accurate knowledge of their powers and various offices.

COUNT RUMFORD'S APPARATUS FOR PRESERVING THE AROMATIC FRAGRANCE OF HIS ROASTED AND GROUND COFFEE.

If the coffee in powder is not well defended from the air it loses its flavour, and becomes of little value; and the liquor is never in so high perfection as when the coffee is made immediately after the grain is roasted.

As the roasting and grinding of coffee take up some considerable time, and cannot always be done without inconvenience at the moment the coffee is wanted, I contrived a box for keeping the ground

coffee, which I have found by several years' experience, to preserve the coffee much better than any of the vessels commonly used for that purpose. It is a cylindrical box made of strong tin, $4\frac{1}{4}$ inches in diameter, and 5 inches in height, formed as accurately as possible within, to which a piston is so adapted as to close it very exactly; and when pressed down into it, to remain in the place where it is left, without being in danger of being pushed upwards by the elasticity of the ground coffee which it is destined to confine. This piston is composed of a circular plate of very stout tin, which is soldered to the lower part of an elastic hoop of tin, about two inches wide, which is made to fit into the cylindrical box as exactly as possible, and so as not to be moved up and down in it without employing considerable force. This hoop is rendered elastic by means of a number of vertical slits made in the sides of it. On the upper side of the circular plate of tin, which closes this hoop below, and in the centre of it there is fixed a strong ring, of about one inch diameter, which serves instead of a piston rod, or a handle for the piston. The cylindrical box is closed above by a cover, which is fitted to it with care, in order that the air which is shut up within the box (between the piston and the cover) might be well confined.

MISCELLANEOUS & SCIENTIFIC INTELLIGENCE.

Sir H. Davy's important Experiments on the Corrosion of Copper by Sea Water.—At a late meeting of the Royal Society, Sir H. Davy read a paper on the cause of the corrosion and decay of the copper on ship's bottoms, which is usually ascribed to the feeble yet constant chemical action of the saline particles on the surface of the copper. Sir H. Davy, however, finds this action to be more of a galvanic nature; and it is well known that some kinds of copper are corroded in a much less degree than others that contain a small quantity of zinc or other metal. Sir H. Davy has now shewn, that if a small surface of tin be brought into contact with a surface of copper 100 times its size, the copper is, by that means, rendered so negatively electrical, that the sea-water is no longer able to corrode it, and that the same effect is produced when a small portion of tin is made to communicate to a large surface of copper by a connecting wire.

In further corroboration of these important facts, a comparative set of experiments was made, by submitting to the action of sea water, a piece of Mr. Mushet's patent copper,—a piece of common copper, and a piece of the same metal rendered negatively electrical as before-mentioned, but with a piece of zinc. The results were as follow:—the common copper was highly corroded: Mushet's copper less corroded: but the negatively electrified copper was *not corroded at all!*

Recent interesting Discoveries in Pompeii.—In this city, which has been buried more than 1700 years by the ashes of Vesuvius, the excavations are still continued, though but slowly, as only about a dozen men carry on the work; nevertheless, very frequent

and interesting discoveries are made. The houses appear to be generally small, and consist of but two stories; yet they are beautifully painted. The figures of horses, peacocks, and other animals, are as fresh, and the colours as bright, as the day they were painted. In the Strada die Mercantis, there are very numerous shops of music-sellers, statuaries, and bakers, with their owners' names painted upon them in red letters, and signs rudely carved over the doors.—A villa, consisting of three stories, was observed belonging to a man named Arius Diomedes, having his name at the side of the door. In the cellar, beside some jars of wine which were still standing, was found the skeleton of a man, supposed to have been the owner, holding a purse in one hand, and some trinkets in the other. Behind him was the skeleton of another man, probably his servant, bearing some silver and bronze vases. It would appear from a ticket of sale, stuck upon the wall of another house, that one person had no fewer than 900 shops to let.

Native Iron found at Bogota, in South America.—Humboldt has lately communicated to the French Academy of Sciences an extract of a letter from M. Boursingault, at Santa Fe de la Bogota, in which he states, that he found in the cordeillara of Santa Rosa, between Timja and Bogota, several masses of very ductile native Iron, one of which weighed about 30 quintals.

Surprising power of Germination possessed by Maize, or Indian Corn.—It was the custom of the ancient Peruvians to bury in the graves with the dead a quantity of Indian Corn, or Maize.—Several of these graves, which were closed before the arrival of the Spaniards in that country (now more than 300 years ago), have recently been opened, and the Maize found in them was still so fresh, that it was planted, grew to maturity, and bore seed.

Substitute for Cork.—The spongy wood of the black poplar is used by the Cossacks for stoppers to their bottles, instead of cork, and forms a very good substitute.

Perfumes prejudicial to Health.—The generality of Perfumes are made up of musk, civet, ambergris, cedar, roses, orange-flowers, jonquils, jessamines, tuberoses, and other odoriferous flowers and plants. The use of Perfumes among the Hebrews, and most of the oriental nations, was common, before it was known to the Greeks and Romans. As the nervous system is very much affected by the use of these volatile drugs, medical men generally strongly condemn the practice, still so much in fashion, of scenting the clothes, hands, face, &c. with them.

Vegetable Increase.—The seeds of many kinds of vegetables are so numerous, that if the whole produce of a single plant were put into earth, and to come to maturity in due course, the whole surface of the earth would be covered with them in a few years. The hyosciamus, which of all known plants, produces the greatest number of seeds, would for this purpose require no more than four years. According to some experiments, it has been found that one stem of

the hyosciamus produces more than 50,000 seeds, and if we admit the number to be only 10,000, it would amount, at the fourth crop, to 1,000,000,000,000,000,0 ; and as the whole surface of the earth is calculated to contain no more than 5,507,634,452,576,256 square feet, it will be seen that if we allow only a square foot to each plant, the whole surface of the earth would be insufficient to contain the produce of a single hyosciamus at the end of the fourth year.

On the Preservation of Meat.—The Moors have an easy method of preparing flesh-meat, without spices, and very little salt, yet so as to keep it good, and always ready for eating, for two or three years in the warmest climates. The meat thus prepared is called *Elcholle,* and is made of beef, mutton, or camel's-flesh, but chiefly of beef. It is first uniformly cut in long slices, well salted, and suffered to lie twenty-four hours in the pickle. It is then removed from those tubs, or jars, into others filled with fresh water, where it remains for a night; it is next taken out and hung on cords in the sun and air to dry. When thoroughly dry and hard, it is cut into pieces of two or three inches long, and thrown into a pan or cauldron, which is kept ready with boiling oil and suet sufficient to cover it; thus it is boiled, till it be very clear and red on cutting it, when it is again taken out, and set to drain. After having undergone this process, it stands to cool, while jars are prepared for storing it; at the same time pouring upon it the liquid in which it was boiled or fried; and as soon as it is thoroughly cold, the vessels are closely stopped. Preserved in this manner, it will remain hard, and keep good for two years ; the hardest is considered the best and most palatable. Thus it is brought to the table by the Moors, after having been stewed or fried, seasoned either with garlic, or the juice of lemon, and is considered an excellent dish.

Flower Garden.—It is often observed that the finest flowers of the garden perish as their buds open. Upon being closely examined, the leaves or petals will be found perforated with very small holes ; or with the appearance of having been gnawn by very small insects, but which is in fact the work of the snail, though one may not be seen. In such cases it is advisable to take up the sickly flowers either very early in the morning or late in the evening, and to pour boiling water into their beds. The plants should then have their roots carefully cleared of all extraneous substances, before they are replanted. The eggs of the snail may be known by their pearl-like appearance, and are found in quantities at the roots of young plants. When recourse cannot be had to transplanting, another method of taking the snails is, by inverting a large garden pot over the roots, which giving the appearance of night to the snails, they will come out, and fix themselves to its sides. Slugs may be destroyed, by strewing separately over the ground the leaves of cabbages, upon which they will be collected, and are instantly destroyed by pouring lime water over them.

Hydrophobia.—Dr. L. Spalding of New York states, that for above these fifty years the Scuttellaria Lateriflora has proved to be an infallible means for the prevention and cure of Hydrophobia, after

the bite of rabid animals. It should be applied as a dry powder; when fresh it is not so effectual. By the testimonies of several American physicians, it appears that this remedy has given perfect relief in above a thousand cases, as well in the human species as in the brute creation, (dogs, swine, and oxen.)

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

PRINTERS' INK.—To the person who shall invent and discover to the Society the best composition for printers' ink, superior to any hitherto known or in use. The Gold Medal, or Thirty Guineas.

PREVENTING THE MILDEW IN PAPER.—To the person who shall communicate to the Society a process to be used in the manufacture of paper, or some application to be made to manufactured paper, which shall effectually prevent it from becoming mildewed. The Gold Medal or Thirty Guineas.

EXTINGUISHING FIRES.—To the person who shall produce to the Society a method for preventing or extinguishing fires in buildings, superior to any now in use. The Gold Medal, or Thirty Guineas.

HEATING ROOMS FOR THE PURPOSE OF MANUFACTURES.—To the person who shall invent and and discover to the Society a method of heating rooms, superior to, and cheaper than any hitherto known or in use, for the purpose of manufacturers. The Gold Medal, or Thirty Guineas.

RECENT PATENTS.

To WILLIAM DARKER MOSLEY, of the parish of Radford, in the county of Nottingham, lace manufacturer, for his invention of certain improvements in the making and working of machines, used in the manufacture of lace, commonly called bobbin net. Sealed 10th March. Six months for enrolment.

To JEAN HENRY PETELPIERRE, of Charlton Street, Somers' Town, in the county of Middlesex, engineer, for his new-invented engine, or machine, for making the following articles from one piece of leather, without any seam or sewing whatever, that is to say, all kinds of shoes, slippers, gloves, caps, and hats, cartouche boxes, scabbards, and sheaths for swords, bayonets, and knives. Sealed 20th March. Six Months for enrolment.

To RUPERT KIRK, of Osborne Place, Whitechapel, dyer, for his invention of a new method of preparing or manufacturing a certain vegetable substance growing in parts abroad, beyond the seas, and imported to and used in these kingdoms as a dye, or red colouring matter for the use of dyers, called safflower (carthama), so as more effectually to preserve its colouring principle from decay or deterioration in its passage from the places of its growth to England, and other parts of Europe. Sealed 20th March. Two Months for enrolment.

To JAMES ROGERS, of Marlborough, in the county of Wilts, surveyor, for his new-invented improved method, or improved instrument or instruments, for determining or ascertaining the cubic contents of standing timber. Sealed 20th March. Six Months for enrolment.

TO OUR READERS AND CORRESPONDENTS.

M. W's. Communication came too late for insertion in the present number.

Mr. G's. improved Pyrometer shall appear in our next.

J. W's. Communication is the same in substance as an article we had previously prepared on the subject, and have inserted in the present number.

Mr. E. C's. letter is received.

L. H's. machine in our next if possible.

If J. L. will favour us with some further explanations of the details of his scheme, we will have some drawings and engravings executed in illustration; the subject is one of great interest.

[*To be continued every* FORTNIGHT.]

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REGISTER

OF

THE ARTS AND SCIENCES,

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No. 18.] SATURDAY, JUNE 12, 1824. [Price 3*d*.

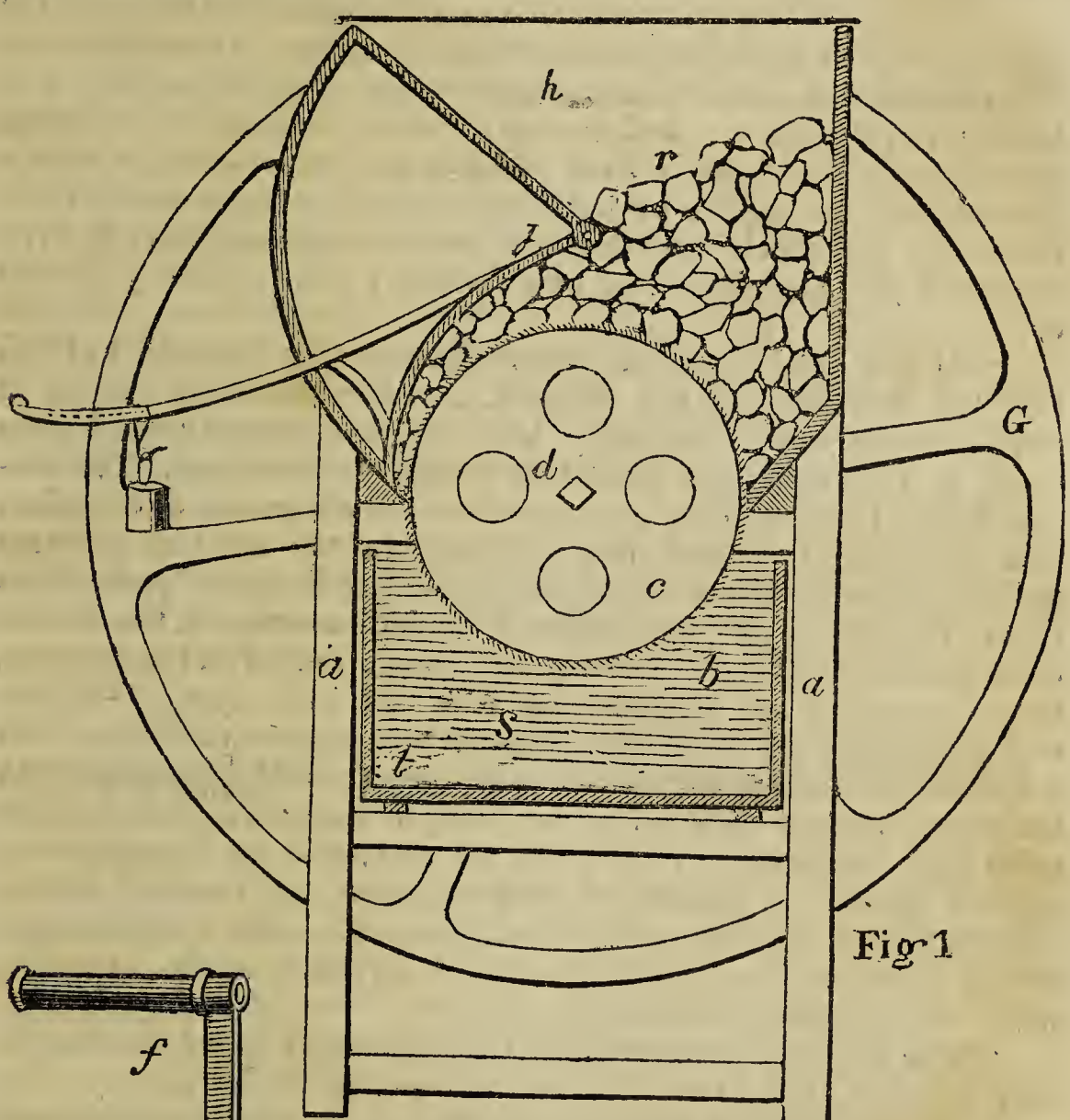


Fig 1

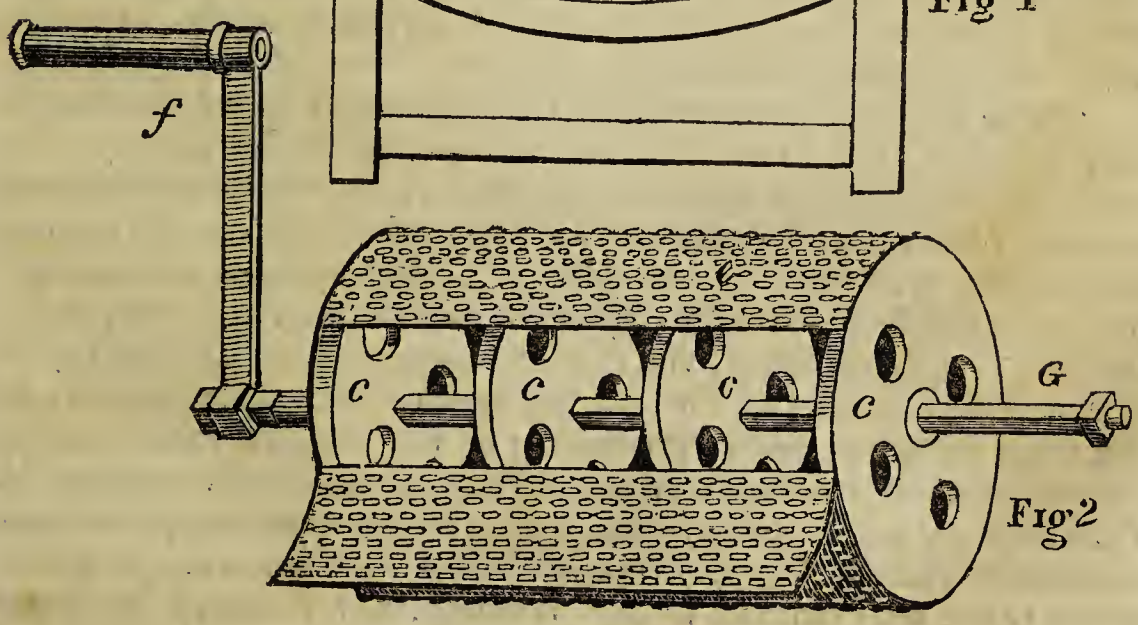


Fig 2

A MACHINE

FOR THE SPEEDY REDUCTION OF POTATOES AND OTHER VEGETABLE ROOTS TO A PULP, FOR THE PURPOSE OF SEPARATING THEIR CONSTITUENT PARTS, MORE ESPECIALLY THE FARINA OR PURE STARCH.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Percival-street, June 2, 1824.

"SIR,

"THE many valuable uses, to which the farina of the Potatoe may be employed, renders the construction of a machine that will separate it from its natural combinations, on the large scale, with facility and dispatch, a desideratum of some importance. Viewing the subject in this light, I have the pleasure to present you with a drawing and description of a Machine, that I invented about three years ago, and which answered the purpose so completely, as even to exceed the most sanguine expectations I had previously formed of it.

"At first sight, some of your readers may be disposed to think that the invention is not original, as other machines, bearing *in certain respects* a great similarity, have been constructed several years since, as I have, myself, indeed very recently discovered. This circumstance, however, only proves the truth of a common observation, that the same invention may originate in the mind of different individuals, without any communication or knowledge of each others ideas. For my own part, Mr. Editor, I solemnly assure you, that I never even heard of any machine having ever been invented for the purpose, until I conceived and executed the one now before you. The idea was given me, by seeing an old woman rasping down Potatoes with a cylindrical bread-grater, for the purpose of making puddings with the flour; when it occurred to me, that if a larger cylinder of the same kind was made to revolve on an axis, and the Potatoes were applied against its superficies with pressure, the work of rasping down might be effected with great rapidity. Founded upon this notion, I constructed my Machine, out of hand, as it now is, excepting some very slight improvements.

"The only two machines that I have hitherto heard of, for the same purpose, differ from mine in some very essential points. The first, M. Beaumé's, is upon the principle of the common coffee mill, —that of the exterior surface of a cone, acting against the internal surface of a cylinder. The second, Mr, Whately's, of Cork, has a very remarkable similarity to mine, in its chief characteristic, but it has one very great defect, viz. that of an unavoidable liability (by its present construction) of the cutting surface becoming clogged, by the teeth filling up, and so preventing or retarding very considerably the operation of grinding: an inconvenience to which neither M. Beaumé's nor mine are subjected, owing to the operating parts being constantly washed clean at every revolution by immersion in water, which is not only omitted by Mr. Whately, but rendered inefficient in his machine by the orifices of his cylinder being closed by the bed on which it rests, instead of being open throughout. Any person

doubting this, may easily satisfy himself of its truth, by operating upon a few Potatoes in a basin with a common bread-grater, first without water, and afterwards with; and he will then be able to conceive the still greater increase of time and labour requisite in the operation, if the orifices of the grater were closed in the inside by a frame or bed of wood, as is the case in Mr. Whately's machine.—Not to exhaust the patience of your readers by further preface, I will now proceed to the description of my Machine.

"Fig. 1, is a longitudinal section of the Machine.

"Fig. 2, is a perspective view of the grinding cylinder.

"N. B. The same letter denotes the same parts in each of the figures.

"*a*, *a*, is a strong square frame or stand made of wood.

"*b*, is a water-tight square cistern for containing water.

"*c*, is a sectional view of the grinding cylinder, 11 inches in diameter, and 24 inches long; shewn also in perspective. Fig. 2., wherein 4 circular wooden plates or wheels, C, C, C, C, are exhibited, similar to that shewn in section Fig. 1. The four large perforations in each are for the free admission and passage of the water, &c. The axis or shaft *d*, upon which the cylinder turns, is made of a square bar of iron, and passes through the centre of the wooden plates C. The covering or superficies of the cylinder is a sheet of double rolled plate iron, *e*, perforated throughout very closely with small holes, which should be produced by means of a steel punch, with a point that forms a quadrangular pyramid, which raises four distinct burs or teeth to every hole, admirably adapted to the purpose of rasping.

"*f*, is the winch or handle to give motion to the Machine;—by the application of a crank to this part, it may be moved by any other more desirable power.

"*g*, is the fly wheel.

"*h*, is the hopper of the peculiar figure shewn, partly filled with Potatoes; it is fitted into a square frame, which encompasses the upper half of the cylinder without touching it. This hopper has a flexible or moveable part *i*, swinging upon the joint *j*, and serves to press the Potatoes (or other roots) against the surface of the cylinder by means of the lever *k*, which has several notches in its upper surface, for the purpose of suspending a weight at any required distance from the fulcrum, so as to produce whatever degree of pressure may be desirable.

"*l*, the circular side of the hopper, made of sheet iron and bent to the figure, it has a longitudinal slit in the middle nearly its whole length, to allow the lever *k* to traverse, and as a guide to it. This part should be made to take or slide out easily from its bearings, to remove any obstructions, or for making such slight repairs under the lever, as may occasionally be required.

"*o*, is a portion of the surface of the cylinder turned back to shew its internal construction.

"*r*, the Potatoes in the hopper.

"*s*, this shadowed* part is intended to represent the Potatoe reduced to the state of pulp and fibre.

"*t*, a portion of the starch separated from the pulp, and lying in a mass at the bottom of the cistern.

"In setting this Machine to work, the hopper is to be filled with Potatoes (already washed and brushed perfectly clean), and the cistern is to be about two-thirds filled with water;—or so, that the cylinder dips about two inches into it. The weight is then applied to the lever *k*, and the operation of grinding commenced, and continued, until the cistern is nearly filled with the pulp; but before this takes place, the water in the cistern rises so much that a portion of it must be taken away, either by means of a bowl, or by a pipe inserted in the side of the cistern nearly at the top, to allow it to run off into another vessel, as it fills. The water so drawn off contains a portion of starch, and it will be found convenient to put it back into the cistern after it has been emptied. The grinding of a bushel of Potatoes into pulp by a Machine of this size takes a man about a quarter of an hour. The next process is the separation of the starch from the fibre, and other extraneous parts, as contained in the cistern; for this purpose the cistern, which is upon rollers, is drawn forward out of its situation in the frame about 6 inches, which gives room to a man to empty it with a bowl. A tall wide-mouthed conical tub was next provided, with a piece of fine lawn stretched over it to form a strainer, which was tied down with a cord passing round it and under a hoop. On this strainer the operator threw a small bowl full of the pulpy liquid, upon which was also dashed another bowlfull of clear water, and stirring it up with one hand, the greater part of the starch passed off rapidly through the strainer into the tub beneath, leaving the fibrous part on the strainer mixed with but a small portion of the starch; which is entirely carried off by a second effusion of water. The fibrous matter is then cleared off the strainer, another quantity of pulp thrown on, and the farina separated as before by effusions of fresh water; proceeding in this manner until the whole contents of the cistern are emptied. The cistern is again about two-thirds filled with water, the hopper replenished with Potatoes, and the grinding and the washing away of the starch is continued alternately. This changing of the operation affords the man an agreeable relief in his work. I used *two* tall tubs with strainers, which were employed in succession, as this arrangement afforded sufficient time for the starch to settle at the bottom, in a solid cake, while the other processes were continued. Cocks placed within four inches of the bottom of each tub were employed to draw off the supernatant liquid, which was always highly coloured, of a reddish brown. The starch was next removed from the bottoms of the tubs, into large glazed earthen pans, holding 10 or 12 gallons each, in which it was washed and mixed with a quantity of fresh water, and allowed to settle again into solid cakes; the water was again decanted, and the starch washed; continuing this operation till the water was colourless, and the starch beautifully white. The next

* The engraver has omitted to shadow this part.

process is that of drying, which I had generally performed in the open air, and exposed to the influence of the sun, in a situation free from dust; to prevent which I had also a cover of linen attached to every frame. When dry the manufacture is completed, and it may then be stowed in flour casks, *in which state it will keep good for five, ten, or even twenty years.*

"In constructing an apparatus for conducting the manufacture on a large scale, there are many adaptations and improvements, which might be made to expedite the work and facilitate the labour; but my arrangements were made only for a temporary use, and for a specific quantity;—consequently, every unnecessary expense was avoided.

"Mr. Whately, of Cork, was rewarded by the Society of Arts, with the Gold Medal, for his invention. Whether my Machine surpasses his, your readers will judge on comparing them; my own conviction is, that it will effect double the work with less labour.

"I remain, Mr. Editor,

"Your humble servant, and constant reader,

"L. H."

We owe our best thanks to L. H. for the several papers which he has, from time to time, sent us. He is a correspondent whom we should be sorry to lose, by the omission of that courtesy which is due to him for communications of so profitable a kind. EDIT.

"*To the Editor of the Register of the Arts and Sciences, &c.*

Bristol, 24th May, 1824.

"SIR,

"I PROMISED you, in the 15th Number of your excellent publication, I would endeavour to point out to your readers, the cause of our men of war going to decay; and show the erroneous manner in which they are at present built and repaired.

"One principal cause is their building them under cover; and we shall never have a ship to depend on while they continue this practice. I shall now, sir, beg to draw your attention, as well as that of your readers, to those vessels that have been built under sheds, which causes them to rot in four or five years. When a man of war is ordered to be built, her frame is got out of green timber, and erected under one of those sheds where it never again sees sun or moon; wind it has plenty of. The air very soon dries the timber, with all the sap or juices in it, and the ship by and by is thought to be thoroughly seasoned; and on they go with the building, plank her up with green plank, finish, launch her, and put her to her moorings. There she begins to get damp, and sweat, from the element she floats in, the sour juices, or vegetable matter which was shut up and dried in the timber while under the shed, now begins to heat and vegetate, causing fungus and mildew to grow. Hence proceeds putrescence, which ends in the dry rot, which has cost the nation so many mil-

lions, and *many more it will cost,* unless they knock down those pernicious sheds; which ought to be done immediately, never minding what they cost erecting,—but down with them smack smooth, as it must be done soon or late.

"Now let us take a view of the men of war that have been built in the open air, exposed to sun, winds, and rains, and open to all weather, and compare these ships with those built under sheds. The Lion was seven years on the stocks, at Portsmouth, before she was launched. After being in nearly all the actions, I believe, in the West Indies, and on the American station for three years after, she was opened to repair, and was found to be as sound as an acorn. The Royal Sovereign, I believe, was built at Plymouth, and was, I think, nine years on the slip, exposed to sun, winds, and rain; this ship, also, when opened, proved exceedingly sound. Ships that are built and exposed to all weathers, will last ten, twelve, or fourteen years longer, if left to stand in their frame for three or four winters. The heart of the timber will not get dry for years laying down; the ends may, for two or three feet from each end, but the middle will continue wet, and perhaps would soon rot, were it inclosed and sheltered from the weather.

"Now let us take a survey of a ship just put up in frame with green timber, exposed to all weathers. Here the timber almost stands in an erect posture, in which state it receives all kinds of weather; the heavy rains enter the pores of the timber, and causes it to swell: after this, perhaps, the sun shines out hot, dries the timber again, or shuts up its pores, imperceptibly forcing out those sour juices, or vegetable matter, which dries on the surface of the timber. The next rain that comes washes this away, and so on, alternately, until the timber at last is entirely cleared of its juices. Then in a winter or two the timber will get dried, and seasoned, and being rid of this matter, will bear to be inclosed and shut up. The Navy Board can furnish an account of those ships built out in the open air, exposed to all weather, and how long they lasted; and, also, an account of those ships built under sheds, and *how soon they rotted!* It has been said that cutting down timber at the wrong time, when the sap was fully up in the tree, was the cause; and, most certainly, this is *one* cause. A house-carpenter puts his boards and planks out on an inclined plane, exposed to the sun, winds, and rain, for the rains to wash the sap away, or, as the phrase is, that it may season: and this method has been handed down to them by their great-great-great-grandfathers.

"Having said thus much I must conclude this letter, intending to continue the subject, and point out to you a great many improvements, or rather to do away with what is called (good Lord deliver us!) "improvements" in our men of war. And I will eventually give your readers a plan to preserve their ships twenty or thirty years sound and healthy, which, I trust, will be noticed by those whose duty it is to learn every thing for the good of the nation, from whatever quarter it may come.

"Your's, &c. E. CAREY."

P. S.—In your 15th Number there is a mistake, either by the printer or myself. It was Feb. 1797: I was in the action with Earl St. Vincent, in the Victory. On the morning of the 1st of June, 1794, you will find me battleing the watch with the French fleet, with Lord Howe.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir,

"'One of your earliest Subscribers,' who is no other than Mr. Stass himself, has called the attention of your numerous readers, in your last Number, on the 'Self-giving Ink Pen,' which I sent you, and with wonderful sang-froid asserts, 'that the inventor of it is a Mr. Stass, who deservedly claims the credit of having been the first to make a fountain-pen, and that it forms a part of a recent communication made by him to the Society of Arts; but, from the tenor of my letter, I take the credit of the invention to myself. Yet, that to those who are acquainted with the subject, I betray my ignorance of half the merits of the invention." Pray, Mr. Stass, how long ago did you invent *your* fountain-pen? Not long ago, I suppose, if I am to judge from your *recent* communication. Now, Mr. Editor, I can prove, by respectable witnesses, on oath, that more than three years ago I had *my* 'Self-giving Ink Pen' in use! I declare, also, that I have neither heard of, nor seen Mr. S.'s pen.

"In forwarding to you the model of my pen, I did so with the intention of contributing my mite to your most valuable work, to which I have been a subscriber from its first appearance. I will deal more generously with Mr. S. by declaring that I sincerely believe he knew nothing of my pen: for, in comparing both pens, it will evidently show that they are not the work of the same hand, though the principle is the same; a principle that has been known these twenty years, as appears from the construction of the metallic pens. Mr. S. sneers at my making use of shoemakers' wax, to prevent the leaking of the quill, and calls it a dirty expedient; the name he gives it is certainly dirty: however, he is quite ignorant that the wax (the size of a very small pea) is dropped at the bottom of the quill *inside*, so that no part of the hand can touch it. In fact, it is made in the same manner as the quills used for fishing floats, and is by far preferable to sealing-wax, which it is difficult to make adhere to a smooth surface, and which is also liable to crack in pressing out the ink.

"I hope, Mr. Editor, you will give this letter a place in your excellent miscellany. I have been unjustly accused of having robbed Mr. Stass of his invention. I repeat it, I am ready to prove that my invention is of more than three years standing.

"I am, Mr. Editor, Your most obedient Servant,

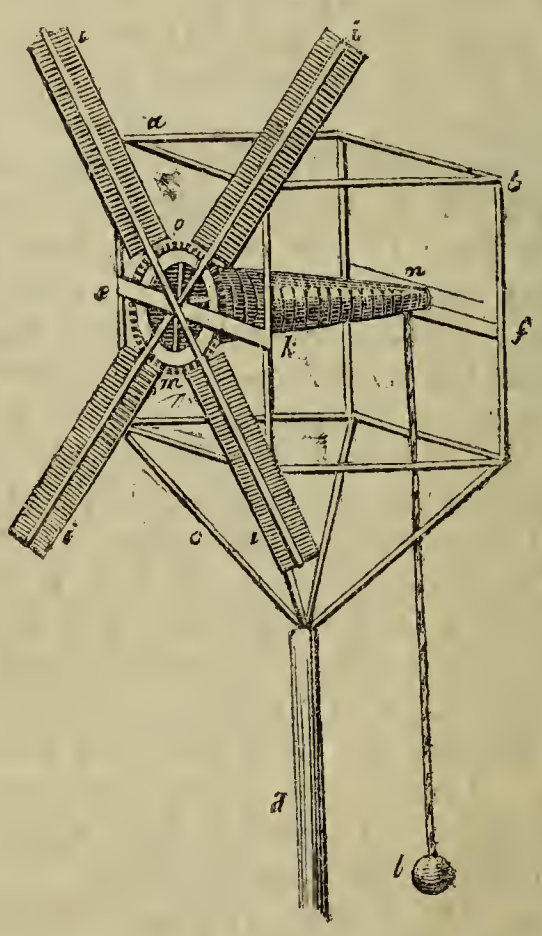
"*June 7*, 1824. "E. D. B."

SELF-GIVING INK PEN.

We avail ourselves of this opportunity to throw out an observation or two upon a question which seems to arise out of the above

subject. By some unaccountable error, an editorial note was omitted to be placed at the foot of the last communication upon this matter, signed "One of your earliest Correspondents;" and we are the more sorry at the apparent neglect, inasmuch as the gentleman, who adopts the signature of E. D. B. appears, as we justly anticipated, offended at the attack which was therein made upon him.

It has oftentimes been to us a matter of pain and surprise, that so much hostile and angry feeling should be displayed by ingenious men, who, from some singular coincidence, have arrived at similar conclusions in their studies and researches. The exercise of a very little calm reason would, we are convinced, in almost all cases, tend to allay the belligerent spirit, which pure accident must have elicited, if persons would but practice the philosophy they have in theory adopted. What is there in life more natural than that two or more individuals, in the prosecution of their inquiries, should strike upon a conception precisely similar; and why is it *necessary* that the operations of the mind, versatile and varied as they are, should be precluded from conducting it to similar inferences and results? And yet what anger and animosity have been shown from effects produced by a cause so natural.



THE ANEMOMETER.

The Anemometer is an instrument for measuring the strength or velocity of the wind. Various machines, for the same purpose, have been invented at different periods; and the one above represented

has perhaps the advantages of greater simplicity of construction, and of being unerring in its indications. It is thus formed :—a square open frame of iron or wood, *a*, *b*, *c*, is supported by the shaft *d*; two cross pieces are fixed at *e*, *f*, carrying an horizontal axis, which is moved by the action of the wind upon four sails, *i*, *i*, *i*, *i*, fixed to one end of the axis, and disposed to be influenced by the wind in the usual manner. Upon this axis is also fixed a conical barrel of wood, on the smaller end of which, *n*, is attached a line with a weight, *l*, appended to it. The wind now acting upon the sails, causes the barrel to revolve, and the line to be wound round its superficies. To prevent any retrograde motion, a ratchet wheel, *o*, is fixed to the base or larger end of the cone, *m*, having a clicker falling into its notches as it revolves. It is evident that the force of the weight will continually increase as the line advances towards the base of the cone, by the power being applied at a greater distance from the axis or fulcrum; consequently the variable force of the wind may be readily ascertained, by fixing the line at the smallest end, and marking the barrel with spiral lines, as taken up by the coiling of the rope round its superficies; placing, also, between the lines so drawn, numericals, to denote the force of the wind; which might be calculated with tolerable precision, according to the known principles of the lever. The diameter of the base of the cone should be such, in comparison with the smaller end, that the very strongest wind should have scarcely sufficient power to bring it on to the end of it.

CONVEYANCE IN VACUO.

At a time when science is less pursued as a grand and delightful study, than as a means to serve the common purposes of mankind; and when, from the astounding discoveries which have lately been made in every branch of knowledge, the speculations of the learned are no longer considered as the "baseless fabric of a vision," but rather, wild soever as they may be, as matters worthy of investigation, it becomes a duty, in every work, to lead the general mind to the contemplation of the projects, sound or unsound, that may be brought before it: the sound, that they may receive the advantage of inquiry; the unsound, that they may be strangled in their birth.

Mr. Vallance (a young man of great abilities) has lately appeared before the world in a new character; a character in which he is supported by good sense and solid argument. He has lately made a statement, before the public, "*On the Facility of Intercourse*," which we conceive to be at once clear, enlightened, and tenable; and we take a pleasure in laying before our readers extracts of his observations, the length of which will be amply compensated by their value. We have no doubt that Mr. Vallance, for projecting such a plan, and ourselves for supporting it, may both be considered as vastly silly by those wise and worthy personages who are given to sneering overmuch; but on this account we hope, and on our part

we know, that the whispers of unjust sarcasm will ever be considered "as the idle wind that bloweth."

"In the progress of civilization," says Mr. Vallance, "few circumstances have been deemed more deserving the attention of states, than those which have facilitated intercourse between the centres of government and remote cities and provinces. One of the first cares of one of the earliest of conquerors, on completing the subjugation of the Assyrian empire, was the establishment of a system of communication between the capital and the extremities of it. And among the circumstances which distinguished the Mexicans from the other nations of the American continent, and proved them more advanced in the path of civilization, were institutions of a similar nature.

"With the Romans, the first undertaking on obtaining possession of a territory they meant to retain, was that of cutting good and durable roads through it; and though the reasons for which they engaged in these labours were originally purely military, yet the opportunity the work afforded for the communication of parts that would otherwise have had no intercourse, and the transit of goods which consequently took place, soon caused them to see that the labour of cutting roads was scarcely less important as an object of civil policy, than as one of military occupation.

"The superior knowledge they possess, and the perception that what a state can create of, and within itself, not what it can wrest from others, constitute its real riches, cause modern nations to go as far beyond the Romans in their ideas of commercial policy, as the Romans went beyond them in their habits of conquest; and works that were known to the ancients only as executed by the state, are with us undertaken and carried through by classes which were in those times utterly destitute both of power and influence.

"Among the circumstances which have tended to confer this power on those who were anciently known only as doing what governments commanded, and furnishing what they choose to exact, none are more marked than the control modern discoveries have given man over the elements; and their being consequently tasked to the execution of his labours, as they are. It is not known that the ancient world derived any advantage from the elements, other than that of naval propulsion by the wind; and it is evident that of human capability, in even this particular, they had a very incomplete idea, or their navies would never have depended upon the oar as they did.

"The effect which this deficiency of knowledge had on their interests, and the degree in which it limited their efforts, may be rendered in some measure evident, by stating, that it might easily be shown that a few individuals, of what is among us termed the middling class of society, could do more, with reference either to sending forth a naval power, or rendering the raw materials a nation produces applicable to the supply of its necessities, than could have been done by the majority of even the civilized states of antiquity.

"But great as are the advances which scientific knowledge has made among us, and vast as are the benefits we in consequence

derive, still must we be considered very remote from the perfection that will eventually be attained. And notwithstanding the rapidity with which we transport ourselves from place to place, of nothing may this more truly be said than of our methods of intercourse.

"Intercourse, to be all that we can desire, should admit of unvarying certainty, rapidity the greatest we can exist under, and of transmission to any extent or weight that may be required.

"In communicating by land there are many things which operate to render these desiderata attainable in only limited proportions. Certainty is affected, and occasionally altogether done away with, by the weather; rapidity, by the incapacity of animals for exertion, either unremitted, or beyond the rate of fifteen or twenty miles an hour; and the quantity transmitted, by the frangibility of the materials of which wheel carriages are made. In communicating by water, the amount that may be transmitted is, to be sure, almost unlimited, but the time it takes up is most uncertain; and steam navigation, supposing it brought to the highest perfection, can do away with only this objection; rapidity cannot perhaps be carried further than sometimes takes place at present.

"To communicate with the utmost possible facility, there are requisite a course free from impediment—the ability of moving with the greatest rapidity we can exist under, and the power of rendering this motion continuous and unremitting. The first of these it is impossible to procure by any method at present known, since even rail-ways are liable to the obstruction arising from deep snows. The second is incompatible with a velocity exceeding fifteen or twenty miles an hour, owing to the inequalities of roads, and the liability of wheel carriages to accident; and though the other may be supplied by relays of horses, so far as relates to the conveyance, yet a journey of forty-eight hours' duration is what many are unequal to, and what few bear unfatigued.

"But although the means of communication we at present possess allow us neither roads free from impediment, the ability of moving with the greatest possible rapidity, nor the power of rendering our progress continuous and unremitting, it may be that other means, of which we can avail ourselves, will admit the attainment of these desiderata.

"It is no very remote period since an expectation was generally entertained, that our means of intercourse were about to receive the very important addition that would arise from being enabled to leave the surface of the earth, and pass over it with almost the velocity of the wind; and though the levity of the medium through which this rapid intercourse was to take place, involves difficulties that are wholly insurmountable, under the knowledge we at present possess, yet would it be going further than we are warranted, to say more than that balloon navigation *appears* impossible.

"But even if the low specific gravity of air should prevent our arranging in this way a method of intercourse which should be rapid as the wind, it does not follow that we may not be able to derive this advantage from others of its properties.

"In execution of the system which, scarcely more than a dozen years ago, was so exclaimed against as 'impossible,' 'absurd,' and 'madness to think of,' there have been laid down in the metropolis, as 'gas-mains,' about 300 miles of cast iron pipe; a quantity which, were it in a continuous line, would reach from one side of the island to the other. Now suppose that this pipe had been laid from London to Falmouth; that at the latter place apparatus were arranged to exhaust the air out of and produce a vacuum in it; and that when the vacuum had been produced, the London end were opened so as to allow air to rush into it towards Falmouth. Would not, (air being known to rush into a vacuum at the rate of nearly 1000 miles an hour,) a most rapid motion takes place inside? And supposing there were any light body in the pipe that nearly filled its bore, would not this body be driven towards Falmouth at the rate of, perhaps, several hundred miles an hour? And if it would, have we not a principle of motion held out to us, that admits of elaboration into means of intercourse rapid to a degree, of which we have hitherto had no conception?

"It will not be denied, that had any circumstance held out a prospect of such an increase of expence being repaid, the 300 miles of gas-pipe, which are laid down in London, might have been six feet in diameter as well as six inches: not that pipe of this, or of greater diameter, might be laid from one end of the island to the other, should it appear that the enormous expence of doing it would be money well laid out; nor that this pipe could be so put together as for its joints to be air-tight;* nor that apparatus could be made capable of exhausting air from, and producing a partial vacuum in it, at any rate we pleased: nor that a machine to run inside it might be made, which, while it so nearly filled the bore as to prevent air passing by to any great extent, should yet be equally free to move as a carriage upon a rail-way; nor that, if air were pumped from one end of the pipe, this machine would receive an impulse tending to carry it along at the same rate the air was pumped out from before it; or, (supposing the vacuum to have been produced before the machine was allowed to move,) at whatever rate the air was admitted behind it. As these things will not be denied, it is evident that we have the power of producing motion in a way that will carry us forward with a velocity we at present have no conception of, provided we choose to be at the expence of preparing the necessary apparatus; an undertaking which, great as it would be, we may, perhaps, not feel indisposed to, when the advantages it would be productive of are before us."

[*To be continued.*]

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* The joint referred to here is not one that should be tight under a vacuum, which would lower the barometer through its whole range, but one that would be tight under a difference of two or three inches of mercury.

THE ELEMENTS OF NATURAL PHILOSOPHY,

No. 12.—Hydraulics.

[*Continued from No.* 11, *page* 221.]

It would seem a strange inconsistency, at this time of day, to neglect to notice, when treating of the science of Hydraulics, that grand and noble master-piece of human knowledge the Steam Engine; but when it is considered how great and multifarious have been the alterations and improvements in this stupendous machine (since its first invention by the Marquis of Worcester, in the reign of the Second Charles), and how utterly useless, and altogether impracticable, it would be to attempt a description of so apparently complex a power, with a view of conveying information to those who are ignorant of the principle upon which it acts,—we shall readily be pardoned from entering into the brief details which our largest limits would allow us. The fact is, that we have it in contemplation to draw up a succinct and intelligible account of the Steam Engine, of its operations, and effects, and to diffuse it over the pages of our Journal, undisturbed by, and unconnected with, any irrelevant topic, in just such quantities as shall enable such of our readers as may be unacquainted with it, to acquire and retain a general and sufficient knowledge of the subject, without loading the memory with all the minutiæ which a more amplified history might properly demand.

We shall therefore terminate all further remarks under the head of Hydraulics, and proceed at once to the laws of

Optics.

As the science of vision depends upon the properties of light, and as in considering this subject we shall have to go somewhat into technicalities, it will be proper to allude to the Optical Definitions, in order that the observations to follow may be less circuitous, and more conformable to the plans ordinarily adopted.

By a *ray* of light is meant the motion of a single particle; and its motion is represented by a straight line.

Any parcel of rays proceeding from a point is called *a pencil of rays.*

A *medium* is any pellucid or transparent body which suffers light to pass through it, such as water, air, and glass; and these therefore are mediums, (or, to use the Latin plural termination, which is most generally adopted, *media)* through which light may unobstructedly pass.

Parallel rays are such as move always at the same distance from each other.

If rays continually *recede* from each other (this may be figured to the mind by lines drawn from the *corner* of a right-angled triangle to the opposite perpendicular) they are said to *converge.*

If they continually approach towards each other (as by

reversing the preceding illustration) they are said to *diverge*.

The point at which conveying rays meet is called the *focus*.

The point to which they tend, but to which they are prevented arriving by some obstacle, is called the *imaginary focus*.

When rays after passing through one medium, on entering another, are bent out of their former course and made to change their direction they are said to be *refracted*.

When they strike against a surface and are sent back again from the surface they are said to be *reflected*.

The *incident ray* is that which comes from any luminous body and falls upon the reflecting surface. The *angle of incidence* is that which is contained between the incident ray and a perpendicular to the reflecting surface in the point of reflection.

The *angle of reflection* is that contained between the perpendicular and the reflected ray.

The *angle of refraction* is that contained between the refracted ray and the perpendicular.

A *mirror* or *speculum* is an opaque body, whose surface is very smooth and finely polished, so that it will reflect the rays of light which fall upon it, and by this means represent the images of objects opposed to it.

Mirrors are generally made of metal or of glass, polished on one side and silvered on the other, and they are either *plane, convex,* or *concave.*

Plane mirrors are those whose surfaces are perfect planes, and whose section is a straight line, such are vulgarly called *looking-glasses.*

Convex mirrors are those whose middle parts are more prominent than their extremities or edges, and whose sections are curves, which may be either *circular, elliptical, parabolical,* or *hyperbolical.*

Concave mirrors are those whose surfaces are hollow, and whose centre is the deepest sunk. The sections of these may be curves as various as the last.

A *lens* is glass ground into such a form as to collect or disperse the rays of light which pass through it. These are of different shapes, and from thence receive different names.

A *plano-convex* has one side flat of the other convex.

A *plano-concave* is flat on one side and plane on the other.

A *double convex* is convex on both sides.

A *double concave* is concave on both sides.

A *meniscus* is convex on one side and concave on the other.

A line passing through the centre of a lens is called its *axis.*

MR. TIMBRELL'S PATENT IMPROVEMENT TO A SHIP'S RUDDER AND STEERAGE.

This invention consists in the application of a flap or shutter to each side of the stern-post, or other after part of a vessel, in such a manner as to fall over against the rudder, and cover the spaces between the fore part of the rudder, and the after part of the stern-post, (occasioned by the pentles and braces on which the rudder is hung), so as to prevent the action of the water against the fore part of the rudder when the vessel is moving forward.

A copper bolt is braced on to the edge of the shutter, and on that bolt are fixed four or five small pentles; these pentles are placed in corresponding gudgeons fixed to the stern-post, on which therefore the shutter hangs and traverses. The bottom of the copper bolt is received and turns in a socket, instead of the common gudgeon. When the vessel has stern way, the shutter falls back against the braces of the rudder, and closes up the apertures between that and the stern-post.

Another mode by which the patentee fastens the shutters to the stern-post, is by means of round hinges, through which a bolt or rod may pass, and act in a socket, as before-mentioned.

MISCELLANEOUS INTELLIGENCE.

Colouring Prints.—Persons who wish to colour prints should wash them first with alum-water, which will prevent the colour from sinking, besides giving a lustre and brightness to them. For this purpose, boil four ounces of alum in a quart of clear water till the alum is dissolved.

Dairy.—"The pernicious practice of keeping milk in leaden vessels, and salting butter in stone jars, begins to gain ground among some of the fine ladies in this county, as well as elsewhere, from an idea of cleanliness. The fact is, it is just the reverse of cleanliness; for, in the hands of a careful person, nothing can be more cleanly than wooden dishes; but under the management of a slattern, they discover the secret, which stone dishes do not. In return, these latter communicate to the butter and the milk, which has been kept in them, a poisonous quality, which inevitably proves destructive to the human constitution. To the prevalence of this practice, I have no doubt, we must attribute the frequency of palsies, which begin to prevail so much in this kingdom; for the well known effect of the poison of lead is bodily debility, palsy, death!"—*Dr. James Anderson's View of the Agriculture of the County of Aberdeen.*

Russian Mode of Cleaning Windows.—When snow or ice is mixed with salt, both begin to liquify; in this state it is employed in Russia for cleaning windows that are covered with frost. They are rubbed with a dry sponge, dipped in salt, by which means they become immediately transparent.

RECENT PATENTS.

To JAMES SMITH, of Droitwich, Worcestershire, civil engineer, for an apparatus for the applying of steam for the cooling and concentration of solutions in general, crystallizing the muriate of soda from brines containing that salt, melting and refining of tallow and oils, boiling of sugar, distilling, and other similar purposes. Sealed at Edinburgh, August 18, 1823.

To WILLIAM WIGTON, of Derby, Derbyshire, engineer, for certain improvements in steam-engines. Sealed at Edinburgh, August 18, 1823.

To CHARLES ANTHONY DEANE, of Charles Street, Deptford, ship-caulker, for an apparatus or machine, to be worn by persons entering rooms or other places filled with smoke or other vapour, for the purpose of extinguishing fire, or extricating persons or property therein. Sealed at Edinburgh, December 4, 1823.

To FRANCIS GIBBON SPILSBURY, of Walsal, Staffordshire, for certain improvements in tanning. Sealed at Edinburgh, December 4, 1823.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

IMPROVED BLACK DYE FOR SILK OR WOOL.—To the person who shall invent and discover to the Society a black dye for silk or wool, superior in colour and durability to any at present in use. The Gold Medal or Fifty Guineas.

AN ORIGINAL SCREW.—To the person who shall invent and make known to the Society any mode of producing an original screw more perfect than any hitherto known. The Gold Medal, or Thirty Guineas.

To the person who shall complete and publish an accurate Mineralogical and Geological MAP of IRELAND, on a scale of not less than five miles to an inch, containing particulars described in the foregoing premium. The Gold Medal, or Fifty Guineas.

FLINT GLASS.—To the person who shall make flint glass free from veins, and as dense and transparent as the best now in use, and quite fit for the purposes of opticians. The Gold Medal, or Thirty Guineas.

REFINING WHALE OR SEAL OIL.—To the person who shall invent and discover to the Society an effectual method of purifying whale or seal oil from the glutinous matter that encrusts to the wicks of lamps, and extinguishes the light, though fully supplied with oil, provided that such purified oil resists congelation in an equal degree with the unpurified. The Gold Medal, or Fifty Guineas.

TO OUR READERS AND CORRESPONDENTS.

H. H. need not be at all troubled as to the peculiarity of the soil. Let him throw Macadamized stones into a trench, and he may build the tower of Babel thereupon if he choose. A flat stone is one of the worst things in the world—if any corner of it gives way, utter ruin must follow to the whole building.

O. Y. E. has been received, and will be attended to.

A. on *modern improvements* is not sufficiently digested for publicity. He must remember that "*chaste*" should always rhyme with "*taste!*"

We are really sorry to refuse "John K." the "favour we ought to grant"—we cannot do violence to the regulations we have established for individual pleasure.

We are utterly at a loss to account for the motives of L. W. he must be greatly in error.

"A Constant Reader!" The Gentleman who adopts this venerable cognomen must have cruelly mistaken our views.

A W. T.—Simon—J. L.—J. B.—A. C.—Nemo—S. G.—H. M. J.—Lefevre—and John Smith have been received.

To the communication of Archimedes shall be given every consideration.

[*To be continued every* FORTNIGHT.]

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REGISTER

OF

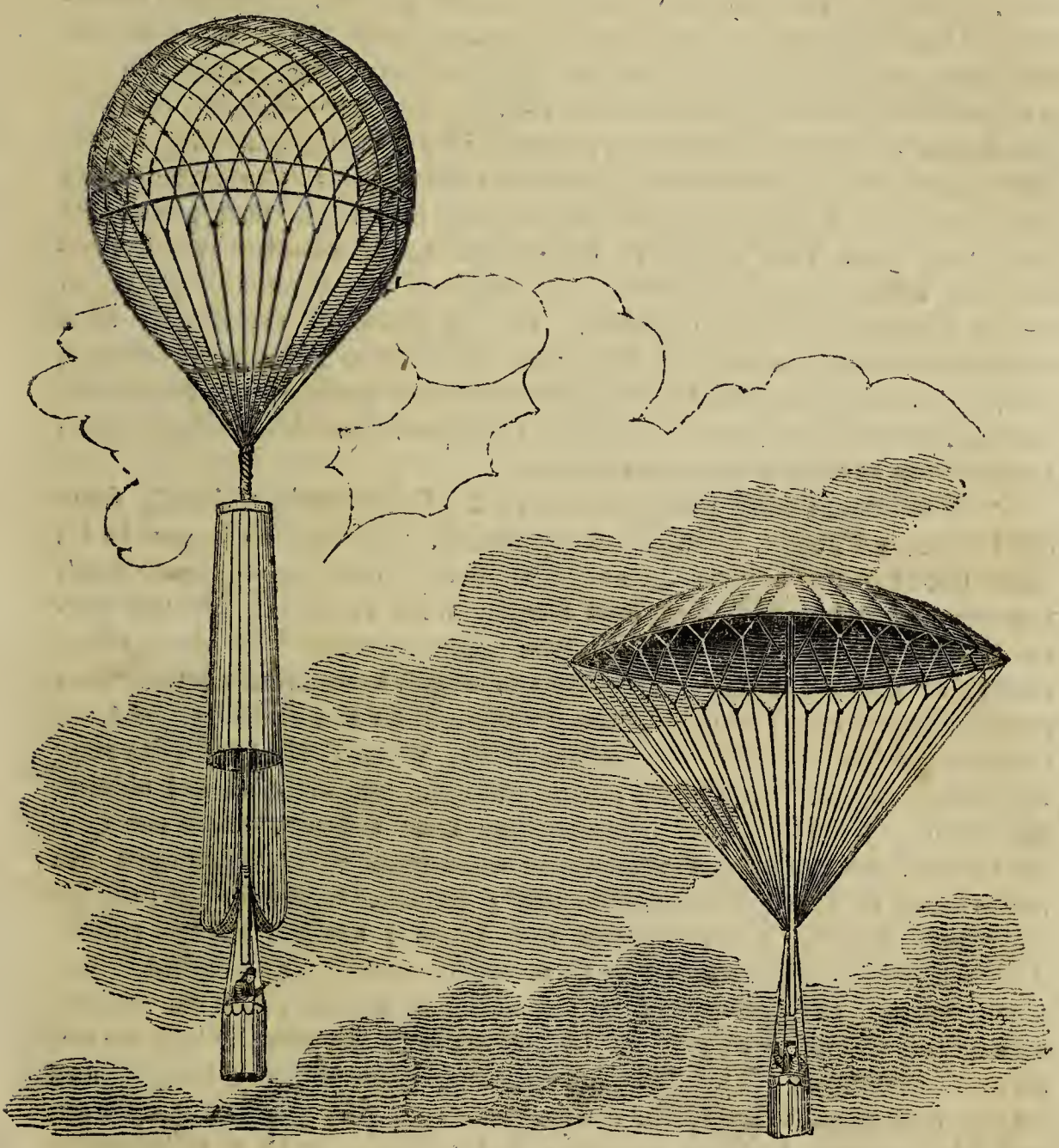
THE ARTS AND SCIENCES,

IMPROVEMENTS & DISCOVERIES.

No. 19.] SATURDAY, JUNE 26, 1824. [Price 3*d*.

ASCENT WITH THE PARACHUTE.

DESCENT BY THE PARACHUTE.



" To the Editor of the Register of the Arts and Sciences, &c.

" SIR,

" As a great degree of interest has recently been excited by aerial navigation, perhaps the enclosed representation and description of the manner of descending from a Balloon by means

of a Parachute, may prove acceptable to many of your readers, more particularly that juvenile portion who are too young to have witnessed that daring exploit of M. Garnerin, in 1802. I was one of the many thousands of spectators, on that occasion, and shall never cease to feel the deepest admiration at the sublime intrepidity of that ingenious Frenchman.

"The Balloon was of the usual form, made of oiled silk, and filled with inflammable gas; it was covered, as represented, with a netting, from which cords proceeded that were tied together at a few feet below the Balloon; the several cords thus collected were then twisted, so as to form a single rope, which was passed through the Parachute, and fastened to the car or basket. The real structure of the Parachute is best seen in its expanded state, as shewn in the descent,—forming a near resemblance to a large umbrella; it was made of canvas, and about 30 feet in diameter;—it had no ribs, the figure of its dome being preserved by the surrounding cords. The length of these cords or ropes, from the edges of the dome of the Parachute, to where they are connected together, was about 30 feet, and from this point of connexion other shorter ropes proceeded, which were attached to the edges of the circular basket in which the aeronaut was situated. In the place of the handle of a common umbrella, a long tin tube was fixed in the Parachute, through which the single rope before-mentioned was passed, to prevent its becoming entangled, and to allow it to slip away with certainty when severed for the purpose of descending.

"The ascent took place on the 21st of September, 1802, from St. George's Parade, North Audley-street. The balloon began to be filled about two o'clock; 33 casks filled with diluted sulphuric acid, together with a quantity of iron filings, were employed for the production of the hydrogen gas. These communicated with three other casks, or general receivers, to each of which was affixed a tube that emptied itself into the main tube connected to the Balloon. At six o'clock the Balloon was completely filled, when it rose with its long appendage of the Parachute, the aeronaut in the little basket closing the train. Thousands of acclamations rent the air, while the eyes of tens of thousands of spectators were fixed in astonishment and admiration at the gallant adventurer; feelings which could only be surpassed by the most intense and painful anxiety for his safety. The weather was beautifully fine, with scarcely any wind. For eight minutes this intrepid man continued to ascend, till he arrived at such an immense height as to be scarcely visible; when he cut away the Balloon. The Parachute did not expand immediately, and he fell with great velocity for a short space of time; when it opened, and his descent became gradual; but attended with a remarkable occillation like the pendulum of a clock, to that degree at one time, that the Parachute, cords, basket and aeronaut appeared to be stretched in an horizontal line. At length, as he approached the earth these vibrations were less extended, and continued to diminish till he reached the ground, which he did without any injury to himself or the apparatus, which he brought down with him, in a field

near the Small Pox Hospital, at Pancras. The Balloon was observed to ascend rapidly after separation from the Parachute, and was soon out of sight.

"I remain, Mr. Editor,

"Your obedient servant,

"L. H.

"P. S. I have annexed an account of the ascension of the largest aerostatic machine ever constructed. If you think, Mr. Editor, that there is sufficient of novelty or interest about it, you will, perhaps, give it a corner of your Register."

THE LARGEST BALLOON THAT EVER ASCENDED.

"The largest aerostatic machine ever constructed was filled with rarified air, and launched at Lyons on the 19th January, 1784. The horizontal diameter of this Balloon was 104 feet, and its height 113 feet. Its weight, including seven passengers, was about 1,600 pounds. Messrs. Joseph Montgolfier and Pilatre de Rosier were among the passengers, who were all stationed in a gallery made for their reception. The machine was considered in so imperfect a state, that the seven persons who had stationed themselves in the gallery were entreated to get out, but they refused to relinquish their places, and as soon as the inflation was completed it rose majestically into the air, to the height of 3000 feet. This spectacle, the most sublime and magnificent that was perhaps ever occasioned by human invention, had an effect upon the assembled multitude of the most extraordinary nature. Shrieks from fear, together with the loudest acclamations, martial music, and the discharge of cannon, conspired to produce an effect more easily to be conceived than described—Some women were fainting, others crying; while numbers fell on their knees and implored the protection of Heaven on the resolute aerial travellers, who continued to wave their hats with expressions of perfect confidence and satisfaction. This vast machine was observed to be almost stationary in the air for the space of four minutes, when, by some misfortune, a rent was made in it, which caused it to descend, and when it had reached within 600 feet of the earth, its velocity was so much increased, that the greatest apprehensions were entertained for the safety of the travellers.—More than 600,000 people, it is said, ran to the spot—and the adventurers were happily landed and helped out of the gallery, without any one receiving the least personal injury."

[Improvements in "Ballooning."—As our present Number was going to press, we received a letter from an ingenious Correspondent, signed G. L. proposing some important improvements to Balloons, the object of which is to lessen the danger of the "descent," and for which purpose, they appear to us, admirably calculated. The subject will be introduced into our next Number, together with an elucidatory engraving.]

CONVEYANCE IN VACUO.

(Continued from page 284.)

"It was soon seen, after man had subjected the larger animals to his power, that combining the efforts of a number of them would conduce to his advantage; and measures being accordingly taken for the purpose, generations the most remote have benefited by the practice. But though it has been easy to combine the exertions of cattle to a certain extent, difficulties it is unnecessary to enumerate have prevented its being done, so as to render a combination of more than eight or ten horses, a convenient and common practice; and with our forefathers a power superior to the efforts of twelve horses was not perhaps known.

"In conformity with this idea of combining power, it has, from the period when philosophy, by bringing steam to our aid, placed unlimited power at our command, been an object to avail ourselves of it as a loco-motive, as well as a stationary impellent. But owing to the density of the materials steam-engines are composed of, it has hitherto been found impracticable to derive from them (on land) any loco-motive impulse greater than a dozen horses will impart; and even in these instances, the substitution has been clogged by having to convey the cause of motion itself, as well as the vehicles on which it was to operate. If, however, we arrange methods that will enable us to give motion to air as has been suggested, we shall become possessed of the power of producing a loco-motive impulse equal to the power of many thousand horses acting simultaneously; bring about the saving that may be effected by using elementary first movers instead of cattle; and obtain means of transport rapid almost beyond conception.

"Iron can be wrought into cylinders of any size that may be required for the purpose in question: and those cylinders can be laid on the ground, and connected so as to be air tight to what extent we please. A circle of about 11.5 feet diameter has an area of 15,000 square inches. As describing how in this place would turn our attention from the more important to one of the minor features of the case, it must for the present be assumed that a machine, or vehicle, which would run as light as any carriage, on any railway, can be made to move or travel inside any cylinder of 11.5 feet diameter that might be laid down. It must be also assumed, that one end of this machine could be made to act almost as a piston to any such cylinder, without occasioning friction to a degree that would be felt.

"A difference of density that lowers the barometer two inches, gives a variation of pressure equal to a pound per square inch. Supposing, therefore, air were exhausted from a cylinder of 15,000 square inches area, to a degree which caused a barometer inside to stand at "much rain," when another exposure in the open air stood at "set fair," there would be a pressure of about 15,000lbs. against any thing that should so nearly fill its bore, as to form a kind

of piston to it. At about whatever rate, therefore, it is possible to exhaust air from before a vehicle such as has been adverted to in a cylinder of 11.5 feet diameter, and force that air into the atmosphere, will 15,000lbs. be carried forward, even if the cylinder be fixed vertically, and the 15,000lbs. consequently to be lifted perpendicularly.

"Now as air can be pumped out of this vehicle at any rate we please, the velocity with which it may be made to move will be in exact proportion to the power we employ; or in other words, whatever we choose to have it.

"By the effects produced on different rail-roads, it is proved that a power which will raise one pound perpendicularly will draw above 100lbs. horizontally, at the same rate: and on a railway of Mr. H. R. Palmer's invention, it may at any time be seen that the same power will produce the same effect on above 300lbs. Assuming, therefore, (and which will in its proper place be established) that a parallel can be effected between the supposed cylinder and vehicle, and Mr. Palmer's railway, 15,000×300=4,500,00lbs., or 2008 tons, in the weight that might be moved horizontally by the method proposed.

"By combining the action of several horses, a greater weight may be moved than by one only. But no combination of their power will enable us to travel with greater velocity that one moves with, when his load is adapted for expedition.

"In addition, however, to enabling us to move an amount of weight which no animal efforts could render loco-motive, the method under consideration also enables that weight being moved with a velocity that may exceed one, if not two hundred miles an hour.*

"Supposing that when a vacuum is produced in a cylinder, such as has been adverted to, one end of it were opened so as to let the air rush in, the rate at which it would enter is known to be nearly 1000 miles an hour. Owing, however, to friction against the cylinder, this rate would diminish in proportion to the distance passed over; and could the air be admitted only at the end, it would, in the space of a very few miles, be greatly reduced. But almost as soon as we are aware of the objection, does it suggest itself to us that it will be easy to arrange valves, which the moment the vehicle inside should have moved over such a distance (suppose a mile) as sensibly to diminish the rate at which the air might rush along the tube, would open, and admitting the air close behind the vehicle, render the impulse communicated to it only so much less than what it at first received as might suit our convenience.

"The rate of motion being thus what we please to have it (not exceeding perhaps 2 or 300 miles an hour), adopting the usual course with reference to any rate we may fix on, and the weight

* The earth's motion in her orbit carries us forward at the rate of nearly 70,000 miles an hour; and yet not only do we experience any inconvenience from it, but also are we so utterly unconscious of it, that the wise in their own conceit did not hesitate to pronounce the fact impossible, and the asserter a madman.

moved, will give us the amount of the effort exerted in "horse's power;" and assuming that the rate at which the 2008 tons should be moved was 100 miles an hour, the effect would be equal to the power of 4125 horses; an impulse which no combination of animal effort would enable us even to approach to; and which, perhaps, no method other than itself would enable us to produce.

"Steam can be employed as a first mover at an expense of a penny per horse's power per hour.* But it will, by and by, be shewn, that with reference to the proposition in point, it may be employed at an expense of less than one-third of a farthing per horse's power per hour; and as it will also be shewn that a horse's power will convey 20 tons 60 miles in 24 hours, the expense of carrying a ton a mile will be less than the 150th part of a farthing.

"Between the amount that a horse will draw along a canal at the rate of 2½ miles an hour, and what may be moved at the same rate by the method here suggested, the difference is so little, that they may be considered the same: though what difference there is, is in favour of the latter.

"But between the means by which these two amounts are moved the difference is very great. Steam, it has just been said, can be so employed as to produce an effort equal to that of a horse, at an expense that is under the third of a farthing per hour, for every hour that it operates.

"The expense of power equal to that of a horse for 24 hours is consequently less than twopence. To draw 20 tons on a canal 60 miles, every 24 hours, will require three horses. Three horses cannot be kept and driven 60 miles a day for less than 12s. 6d. per diem; and that sum expended on conveying 20 tons 60 miles is half farthing per ton per mile; or 75 times as much as the mere expense of carriage by the proposed plan; a circumstance so importantly in favour of the latter, that were its first cost to be even much greater than it will prove, would render it preferable. How much more so will it be, then, when it is shewn that a method may be followed, by which the plan can be put in practice for an expenditure not exceeding what canals may in general be considered to cost;† and for one-third of what the Caledonian Canal cost per mile.

"And as it will at the same time be shewn, that where a canal brings in a shilling, the proposed method would bring in a pound, there is no present necessity for observing, either upon the political advantages which would result from being able to convey 20,000 tons§ (the weight which operating to the greatest extent the prin-

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* In one of the Cornish mines there is an engine (on Woolf's principle) of 273 horses' power, which burns only six bushels of coals an hour. One bushel therefore does as much work as 45.5 horses would do in the same time.

† This inference is drawn from Rennie's Report on the Grand Southern Canal; the expense of which (6,000l. a mile) he terms "far short of what canals in general cost.

§ As exhausting from the cylinder to a degree which should cause a barometer inside it, to stand one-tenth of an inch lower than one exposed to to the atmosphere stood at, would move about 100 tons, there can be no difficulty as to making the joints tight.

ciple admits of, would move) 100 miles an hour, or upon the kind of impregnable state, which the ability of concentrating the whole population of the kingdom capable of bearing arms, on any given spot, within a few hours, would place us in."

This fragment (which we have now concluded) of Mr. Vallance's astonishing scheme, was merely intended to give his friends a general idea of the nature of it, and not for publication. As it has, however, appeared in a Provincial Paper, and the public curiosity being much alive to this interesting and truly wonderful project, we have felt it our duty to append this explanatory note to the preceding account.

We understand from a gentleman who is acquainted with Mr. Vallance, that he will, 'ere long, be fully prepared to go into all the details of the plan, and to answer and overcome all the apparent difficulties and objections with which it may appear to be beset. From what we have learned, we are ourselves fully persuaded that he will do this. Many of the popular objections he has already successfully replied to in the above account, and others; of a seemingly insurmountable nature his genius has entirely subdued; but of these, and all, the public will in due time be informed by the able and enlightened projector himself.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"SHOULD the following observations be thought worthy a place in your valuable miscellany, they are quite at your service.

"NEW FLUX FOR THE BLOWPIPE.

"DURING the last winter, in making my experiments in mineralogy, chemistry, &c. I endeavoured to form a Flux, that would have a tendency to cause the particle of mineral, under examination, to run into a metallic globule upon the charcoal sooner than any other now in use;—and after two or three trials I found the following compound to answer my expectation very well:—Take of borax 1 ounce, nitre 2 drachms, pounded flint glass 2 drachms, and calcined horse's hoof half an ounce; these are all to be fused together in a crucible, taking care to add the horse's hoof *last*, and stirring it well in with an iron spatula; when it is quite fluid, pour it into cold water, which will render it brittle, and thereby it may be easily pulverized. It is to be kept in well closed phials, free from moisture, and the expense will be very trifling, compared with its great importance.

"T. P."

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

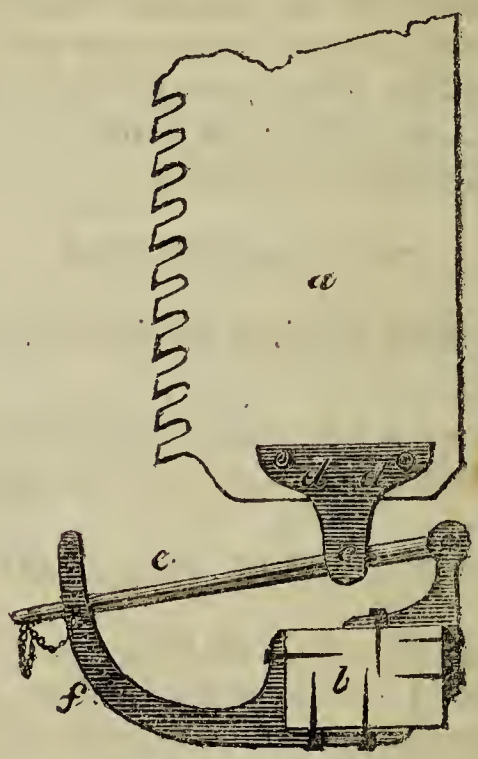
"I BEG leave to propose to your mechanical readers a plan for rendering a frame Pit-saw efficient for cutting long deals, boards, &c.

"As a frame saw can be made thinner than a common pit-saw, it works in a smaller kerf, and where timber is cut into thin board, the gain is considerable. But a frame saw cannot be shifted from one cut to another without a very tedious operation of shifting all the transoms behind the saw to the end of the piece. To obviate this inconvenience, it would be necessary to take the saw out of the frame; but an objection to this would be the difficulty of fixing it in again tight. To obviate this is the intention of the present plan.

"Gentlemen, Your's, &c.

"*Rotherhithe-street,* "A SHIPWRIGHT.

"*June* 4. 1824.



"A, is the lower end of a frame saw.

"B, a section of the lower bar of the frame, *c*, the holdfast, *d d*, the two pins.

"E, the lever.

"F, a double arch pierced with holes, the lever working between the two parts of the arch, the saw can be held to any degree of tightness by a small peg, fastened by a chain to the end of the lever.

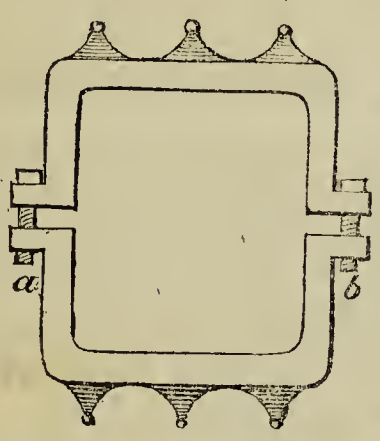
"To shift this saw, press the lever, take out the peg, lift up the lever, take out the two pins, *d d*, and the saw being lifted and swung back, can be put in the next cut and again fastened."

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"HAVING read Lieut. Green's improved method of rigging ships, and seen a model at the Rooms of the Society of Arts, in the Adelphi, with his alterations, &c. complete, I thought a great alteration might be made in his method of fitting the iron straps over the mast head, and thereby the whole rendered more complete and secure, and great time and trouble saved in case of accidents at sea.

"Your readers, by referring to No. 17 of your valuable Register, will there find an engraving of Mr. Green's iron straps, which are to fit over the mast-head, and on to which the shrouds hook. Now, if any accident happens to any one or more of the hooks which are fastened to these straps, as they are all of one piece, it would be necessary to take the ship into port and completely strip the mast, in order to repair the damage; but according to the following sketch, it will be very evident, that any trifling damage might be repaired at sea, provided the vessel takes two or three spare straps with her.



"A and B, are two strong screws which hold the two parts of the strap together, and which may be screwed tighter or unscrewed at pleasure. So that by putting two or three pair of additional straps round the mast head, the shrouds might be slacked and taken down, and a new strap put on, in comparatively little time, and with much less trouble. In order to prevent that part of the mast wearing away, round which the strap fits, I think it would be adviseable to coat the mast with copper or iron, which will prevent the rust from the strap eating away the wood.

"I remain, Sir,

"Your most obedient servant,

"T. P."

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR, "*Egham, June* 12, 1824.

"I WILL feel much obliged if any of the correspondents of your very excellent publication will give me any information as to a cheap method of constructing an Ice-house; and shall be equally thankful for either their ideas or statements of practical results.

"I am, &c. "B. R."

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"MANY of your readers are, I dare say, acquainted with the peculiar motion of camphor when placed in a basin of water; the reason of this motion has, I believe, never been accounted for: it is a very curious property, and for the benefit of such of your readers as have never heard of the experiment I will here repeat it. When small pieces of camphor are placed in a basin of pure water, a very peculiar motion commences, some of the pieces turn as if on an axis, others go steadily round the vessel, some seem to be pursuing others, and thus they continue forming a very curious and pleasing appearance; but if a single drop of sulphuric acid be put into the water, the motion of the camphor instantly stops. If a piece of camphor be lighted, and then carefully placed on the water, it burns with a bright flame, moving about with great rapidity, as if in search of something, but is instantly stopt by a drop of sulphuric acid. If any of your readers or correspondents would, through the medium of your publication, attempt an explanation of this curious fact, they would oblige

"W. L—Y.

"*June* 21, 1824."

[WE have before us a Letter signed Patimirus, from which, although we beg it to be understood that we do not give in to his observations, we have no objection to make an extract. If any of Mr. Carey's assertions appear to be distorted, it lies with Patimirus and not with us. We think it right and proper, and it is our invariable rule, to hear both sides of a question; this and this alone will enable persons to form right notions.]

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Bristol, 15th June, 1824.

"SIR,

"I DO not presume to have such experience in the Docking of Vessels as does Edward Carey, (see No. 14, pp. 229, 30) therefore with due submission I humbly suggest that, as the dock-blocks (see No. 17, p. 257) are always laid straight, and as the ship's keel, by Edward Carey's advice, is to be rendered crooked or convexed to the amount of eighteen inches; something must give way to that amount, that is to say, the blocks must be forced into the bottom of the dock until they fit the ship's keel, or else the ship's keel must be forced upwards until it fits the dockblocks; now the smallest evil that could arise from this crooked method of making a ship go straight would be the crooking or puckering of the copper, the greatest evil will depend on the length and strength of the ship, and her contents, which every ship owner can calculate for himself. Both of these evils may be obviated by using the original plan of deepening the keel, namely, by making the keel straight, from the eighteen inches abaft to a point or nothing forward.

"In pages 216, 217, of No. 14, we are favoured with the newly-invented iron knee and water-ways; don't you think, Mr. Editor, (for all have a right to think and to express their thoughts if they do it with modesty) that instead of six of the deck planks being altogether bolted through ship's side and let down into beams three inches, the American plan of batting three planks to the ship's side, and letting them into the beams only two inches, will be much stronger? And instead of iron knees of four inches wide, use wooden knees as wide as the beam will admit. These knees, you know, are fixed horizontally under the deck, and over what Edward Carey calls his horizontal clamp of ten inches wide and six inches thick; instead of this, the Americans use a vertical clamp, if it may be so called, of fifteen inches deep, (in a ship of about four hundred tons) its upper edge nine inches thick, its lower edge champered off to six inches; through this clamp they bolt the ship's side horizontally, and the beams and also the water-ways completely through the knees perpendicularly. I know you will think as I do, Mr. Editor, that as the iron knee will not admit of this latter bolting the new-invented part of the plan will not be likely to be preferred where timber can be had; and, sir, when you consider how soon an iron knee may become loose, both in its bedding and bolting, through the ship's straining and the corrosion, you will readily see that the American method of the wooden knee being of the whole substance of the beam, (except the two inches cut away for the waterway planks) is more durable than iron knees of four inches wide, which will never admit of re-bolting with larger bolts should they become loose.

"I am, Sir, an admirer of your good intentions

"to disseminate useful knowledge,

"PATIMIRUS."

MONUMENT TO MR. WATT.

On the 19th instant, a public meeting was held at the Freemason's Tavern, to consider the propriety of erecting a monument to the late Mr. James Watt.—The advertisement convening this meeting spoke of Mr. Watt, and justly, as the benefactor of his own country, and of the world. Indeed, it is impossible to contemplate the character of Mr. Watt without the deepest regard for his memory. The strength of his intellect, the originality of his genius, the depth of his judgment, and the application of all these qualities to the practical purposes of life, conferred upon him an eminence far beyond any man of his time. England has, by his death, sustained an irreparable loss, and we do not mean to undervalue the object of the present meeting when we say that the tribute of those, who could not have been insensible to such merits, would have come with a more becoming grace, had it evinced itself before his removal to another world.

The Chairman (Lord Liverpool) after stating the objects of the meeting, announced that His Majesty, deeply sensible of the obligations conferred by Mr. Watt upon this country, had commanded

that his name should be set down to the subscription for £500. (Cheers.)

Sir Humphrey Davy said he ought, perhaps, to apologise for rising so immediately to address the meeting, but as the distinguished individual, to whose merits they were anxious to pay a just tribute, owed his fame to his scientific acquirements, and was a member of that Institution over which he (Sir H. Davy) presided, he would be permitted to speak of his merits. The steam engine, before Mr. Watt's time, had been a rude machine, and his improvements were not fortuitous. (Hear.) He hardly dared to venture on the description of that power; such a subject would better become a more experienced orator. That which was written on the memory of an ancient philosopher was much more applicable to Mr. Watt,—*Si quæris monumentum circumspice* (Hear, hear,) and where was the place, whether on the surface, or below the earth, that did not tell of him and his exertions. His memory would live as long as civilized society existed, but it became those who had known and regarded him, to create a testimonial of their gratitude, in memory of his many deservings. (Hear.)

Mr. Huskisson observed, the economy and abridgment of labour were new facilities for improving the condition of society. They afforded the means of exciting, even in the most untutored minds, fresh wants, and fresh desires; and if he wished to illustrate this, he might say, that not half a century had passed since Cooke was murdered in the Pacific islands by savages, and how were those savages since civilized, and how great were their wants, and how considerably were they raised in the scale of civilized society? If this was the beneficial influence of economy and abridgment of labour at that distance, was it not fairly inferential, that, in this country, their benefits were much more extensive. When they were led to consider the propriety of erecting a Monument to Mr. Watt, let not his unobtrusive merits while living be supposed to disqualify him from sharing posthumous celebrity with those, whose services, though more brilliant, perhaps, were not so substantial. (Hear.) He moved, that the benefits conferred by Mr. Watt on the whole civilized world, has been first and most experienced by his own country, which owes a tribute of national gratitude to a man who has thus honoured her by his genius, and promoted her well being by his discoveries.

Sir J. Mackintosh said he felt it would be unbecoming in him to decline the honour of participating in the sentiments common to all who had with such ability spoken upon this occasion. The name and character of Mr. Watt might justly be presented to them in a double point of view. Had he been known merely for his scientific attainments, his fame would have been handed down to a late posterity—had he been merely the inventor of useful arts, his name would have marked an epoch in the progress of mankind in the arts of life. But Mr. Watt alone, as far as he had heard, combined these two characters, and having made the greatest discoveries in science, he had applied these discoveries to an immediate object. No man was more entitled to the thanks of his country, and of all

mankind. The debt of science to his memory had been paid by the President of the Royal Society. The debt of the State by the responsible ministers of the country, of which he was one of the brightest ornaments. The people generally were not deficient in acknowledging the merit of distinguished men. It was absurd to speak of Mr. Watt, but as one of the most illustrious benefactors to the world, and his achievements exceeded almost all imagination. His discoveries were truly wonderful. He, really, in contemplating such exploits, could not help occasionally indulging trembling hopes, that he would not willingly expose to the eye of the scorner, that there were undiscovered, in the volume of nature, some mighty and magnificent projects.

Mr. Brougham had had the happiness to be acquainted intimately with Mr. Watt,—and they only who knew him by his public merits, prodigious as they were, knew but one half of his worth. (Hear.) A more candid—a more skilful—a more unassuming man—one more scrupulously just and nice in all his actions, he had never yet known, and one of the most extraordinary circumstances connected with his history was, that with the great versatility and variety of his talents, and with his many accomplishments, he brought to every subject, not merely an accuracy of expression, but a critical exactness that made his phrase as peculiarly felicitous as his discoveries were strikingly original. (Hear.) Such were some of the distinctions of that man whose memory they had assembled to celebrate, and to that man's memory he had to propose that a Monument should be raised. This was not necessary for his fame—his memory would last as long as that element which he had subdued. But to preserve that memory fresh in the public mind, and to encourage in that class of society from which he shone forth, a generous spirit of distinction, and for their own gratification, they should place some testimonial to his memory in the place where, of all others, it was most fitting, that he who in his life-time had so largely contributed to the benefit of mankind—not by the sword of slaughter, but by the arts of peace—should have some memorial placed in the Temple of that God whose religion spoke peace and good-will to mankind. He should therefore move, That a Monument be erected to his memory, either in the Cathedral Church of St. Paul's, or in the Collegiate Church of St. Peter's, Westminster.

Several Gentlemen addressed the Meeting, and various Resolutions were adopted, and we understand that between 2 and £3000 were subscribed in the room, and that a Subscription be forthwith opened for that purpose.

THE ELEMENTS OF NATURAL PHILOSOPHY,

No. 13.—Optics.

(Continued from page 286.)

Of Refraction.—If the rays of light, after passing through a medium, enter another medium of a different density, perpendicularly to its surface, they will remain unaffected by the interposition, and

continue to proceed in the same direction as before; but if they enter *obliquely* to the surface of a medium, whether denser or rarer than that in which they were before moving, they are made to change their direction and take a different course.

If the medium which they enter be *denser*, they move through it in a direction nearer to the perpendicular drawn to its surface.—If, on the contrary, they pass out of a denser into a *rarer* medium, they move in a direction farther from the perpendicular.

This refraction is greater or less, that is to say, the rays are more or less bent or turned aside from their original course, as the second medium through which they pass is more or less dense than the first. Thus, for instance, light is more refracted in passing from air into glass, than from air into water; because glass is denser than water. To prove this, put a piece of looking-glass in the bottom of a basin filled with water, the light will be reflected from it, and will be seen to suffer the same refraction as in coming in, only in a contrary direction. Again—put a shilling into the bason when empty, and retire to such a distance from it as will enable you just to lose sight of it—then let water be poured into the bason, and you will then see the money distinctly.

If parallel rays of light fall upon a plano-convex lens they will be so refracted as to unite in a point behind it; and this point is called the *principal focus*, or *focus of parallel rays*, the distance of which from the middle of the lens is called the *focal distance*, which is equal to the diameter of the sphere or circle of which the glass describes the segment.

When parallel rays fall upon a double convex lens, they will be refracted, so as to meet in a focus, whose distance is equal to the radius, or half the diameter of the circle.

Since all the rays of the sun which pass through a convex lens are collected together in its focus, the force of all their heat is collected and united in that part. Hence we see the reason why a convex glass causes the sun's rays, after passing through it, to burn or scorch any object which may lie at the focal distance.

The rays of light diverge from any radiant point, as they do from a principal focus; so that a candle placed in the focus of a convex glass, at the diverging rays, will be so refracted by the glass, that, after going out of it, they will become parallel again.

If the candle be placed nearer the glass than its focal distance, the rays will diverge after passing through the glass, more or less, as the candle is more or less distant from the focus.

If the candle be placed further from the glass than its focal distance, the rays will converge after passing through the glass, and meet in a point which will be more or less distant from the glass as the candle is nearer to, or farther from, its focus; and where the rays meet, they will form an inverted image of the flame of the candle;—this may be seen by placing what is called a *magnifying glass* at the proper distance from a candle, and throwing its image on a board behind.

If rays converge before they enter a convex lens, they are col-

lected at a point nearer to the lens than the focus of the parallel rays. If they diverge before they enter the lens, they are then collected in a point beyond the focus of parallel rays; unless they proceed from a point on the other side, at the same distance with the focus of parallel rays; in which case they are rendered parallel.

If they proceed from a point nearer than that, they diverge afterwards, but in a less degree than before they entered the lens.

When parallel rays pass through a *concave* lens they will diverge, after passing through the glass, as if they had come from a radiant point, which is called the *virtual*, or *imaginary focus*.

New Discovery in Light.—Dr. Forster has discovered a peculiar property in original Light, whereby it is distinguishable from reflected light, namely, the property of the former, of being separated into original colours, by suffering it to pass through a vibrating lens. He promises to describe this method in some future number of the Monthly Magazine.—*Monthly Magazine.*

Improvement in the Galvanic Battery.—Professor Oersted, among his other discoveries on the affinity between electricity and galvanism, has ascertained the important fact, that to produce an active influence on the magnetic needle, and divert it from its position, exposing it to the action of a single pair of discs of copper and zinc, separated by a conducting body, will be sufficient; and that this simple apparatus will act with more force than an entire pile. By this simplification of the galvanic process, he has suspended two plates of copper and zinc separated by a liquid conductor, to a very fine thread; and he has found this arrangement competent to give them a higher degree of mobility, and to render them susceptible of obeying or yielding to the action of exterior agents however feeble. Little bars, strongly magnetized, presenting either of their poles to the apparatus repulsed or attracted it, imparting a rotatory movement about the point of suspension.—*Ibid.*

[We have received the following valuable Recipes from a correspondent, (T. P.) which we readily insert.]

"Milk of Roses.—Windsor soap 3 drams, sweet almonds 3 drams, bitter almonds 3 drams, rose water half a pound: beat them well together in a mortar.

"Bug Poison.—Chlorate of mercury half an ounce, powdered colocynth one ounce, alcohol one pound: to be mixed together, and used with a brush.

"Aromatic Vinegar.—An acetic solution of camphor, oil of cloves, oil of lavender, and oil of rosemary; take a sufficient quantity of each to make it pleasant, and mix them together.

"Essential Salt of Lemons.—Four ounces of cream of tartar, and eight ounces of sal acelosellæ; well mixed together.

"Scouring Drops.—Oil of turpentine, with two or three drops of essence of lemons, which will deprive it of smell.

"Antibilious Pills.—Aloes, scammony, Turkey rhubarb, and tartarized antimony, one grain of each makes one pill.

RECENT PATENTS.

To GEORGE VAUGHAN, of Sheffield, Yorkshire, gentleman, for his improvements on steam-engines, by which means power will be gained, and expense saved. Dated May 1, 1824.

To JAMES VINEY, of Shanklin, in the Isle of Wight, Colonel in the Royal Artillery, for certain improvements in, and additions to, water-closets. Dated May 6, 1824.

To JOSEPH LUCKCOCK, of Round-cottage, Edgebaston, near Birmingham, Warwickshire, gentleman, for improvements in machinery for making pins. Dated May 15, 1824.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

IRRIGATION OF LAND.—To the person who shall discover to the Society the cheapest and most effectual method of raising water, in quantities sufficient, to be beneficially employed for the purpose of irrigating land, superior to, and cheaper, than any other method now in use. The Gold Medal, or Fifty Guineas.

NATURAL HISTORY.—To the author who shall publish the natural history of any county in the United Kingdom. The Gold Medal, or Fifty Guineas.

HARVESTING CORN IN WET WEATHER.—To the person who shall discover to the Society the best and cheapest method, superior to any hitherto practised, of harvesting corn in wet weather. The Gold Medal.

TO OUR READERS AND CORRESPONDENTS.

We have received a letter from Mr. PEACHEY, of Bury St. Edmunds, (the postage of which was not paid) complaining of the treatment he has received from the Society of Arts. He wants to ascertain why that learned body have not given him a reward for his Pump, and we really can't tell him; unless, indeed, he has been writing letters to them, and has not paid the postage, upon which they may feel somewhat sore. He does us the favour to offer information upon a subject in which he appears to be most interested, *provided we pay the postage.* Mr. Peachy seems to be a shrewd man, and is no doubt entitled to some reward; if, however, he likes to send his observations, with any drawings, we will do our duty, that is to say, if the *postage be paid.*

We refer "U. U. X." to the proceedings of the Horticultural Society.

We have to thank W. Y—D for his second communication, which was received too late for insertion in the present number. With respect to the first, if he will have the goodness to read our Register, p. 210, (No. 14,) he will discover that he has laid under a mistake: we hope he will give us occasion to prove that we covet such a Correspondent.

"R. Stevens" will find a letter upon the subject of Aerostation, from which he may derive an idea or two; although it does not go to the full answer of his enquiries.

"Q. in a corner" is not sufficiently conspicuous—*per*spicuous we would say. He must give us a better *cue.*

"A. M....r" shall he seen to.

To the question of "James Yea" we answer *Nay.*

N.'s plan of a parallel ruler is far too complex—the conception is very clever for all that.

Mr. E. C.'s letter is received. The subject of it might well be reduced to one-third of its present extent:---if Mr. C. will allow us to do this, we shall be happy to give it insertion.

Mr. John Gregory's letter is received, the substance of which will be inserted in our next.

"A Member of the Society of Arts," "On the important uses of the farina of Potatoes," will be inserted in an early subsequent Number.

We have received several letters, which arrived too late for present notice. Our other Correspondents will be replied to in our next.

[*To be continued every* FORTNIGHT.]

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Printed by T. H. Coe, Little Carter Lane, St. Paul's.

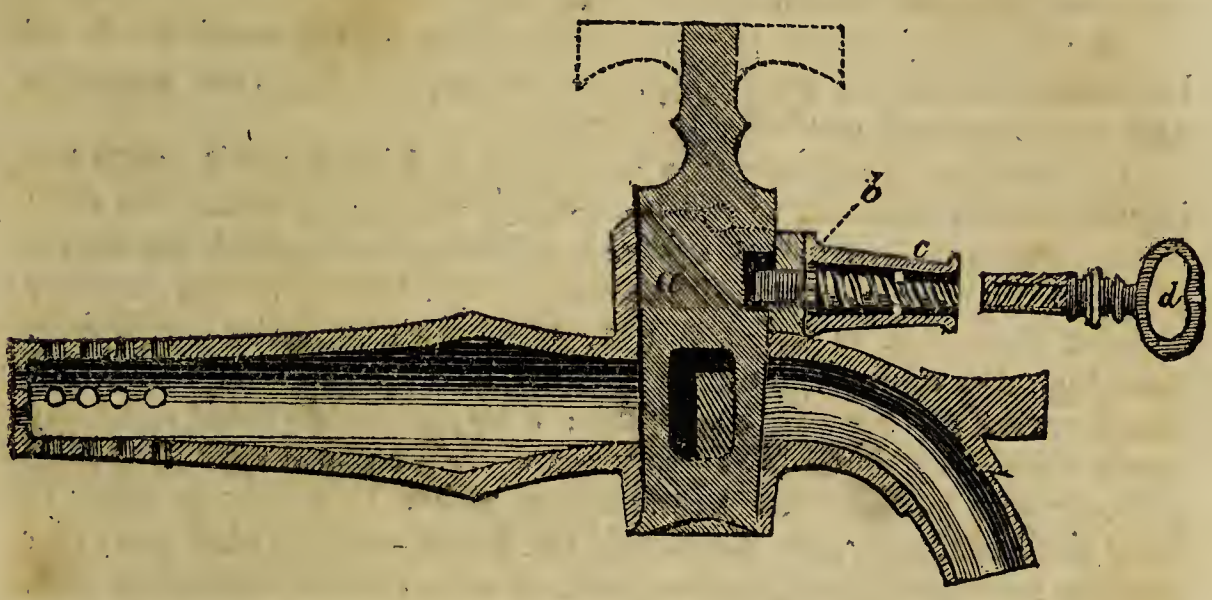
REGISTER

OF

THE ARTS AND SCIENCES,

IMPROVEMENTS & DISCOVERIES.

No. 20]. SATURDAY, JULY 10, 1824. [Price 3*d*.



MR. WM. RUSSELL'S IMPROVED LOCK COCK FOR LIQUOR CASKS.

THERE are few articles for which more patents have been taken out than Liquor Cocks, but they are all, or for the most part so insecure, as to be subject to constant violation. This defect has, however, been most effectually remedied by several ingenious inventions by Mr. Wm. Russell, the engineer, in St. John Street, which, for convenience and security, certainly stand unrivalled.

The construction of the common Lock-Cocks is too well known to need our description; to open any of them is such an easy matter, that we need not wonder at depredations being committed to such an extent upon the contents of casks under their keeping:—a pair of small plyers, a pair of compasses, and even a common table fork are often employed for that purpose. If a key be required, all that is necessary is to take an impression of the perforated cap (that part where the key enters) upon any soft substance, such as wax or soap, or on the ball of the thumb, and a fac-simile of the key may be purchased at any ironmonger's for four pence. Again, cocks of this construction can only be made of the small sizes, suitable for domestic purposes; for to make them of a large bore, would so much increase the friction, as to require a ponderous key to open them. Another objection to the common lock cock (which in reality is no lock at all) is, that the cock cannot be repaired, or fresh ground, without first unsoldering the perforated cap, which is extremely inconvenient, and the heat necessary to resolder it, is frequently injurious, by destroying the lubricating quality of the grease, which surrounds the

ground plug. The second method in practice for locking large cocks is by an iron saddle or staple passing over the plug, and below the bottom of the cock, through which a bolt is put, and a pendant padlock attached; this method is in the first instance expensive, and at all times inconvenient, by having the whole to remove before the cock can be opened, but still it has a decided preference over the former, because cocks of the largest bore are effectually locked by it, and may be repaired without heating. The cocks of large coppers, stills, distillers' vats, &c. are locked in this way.

Having now stated the chief objections to the usual mode of locking liquor cocks, we shall proceed to explain Mr. Wm. Russell's new and improved method.

Our engraving represents a section of a Liquor Cock, with the improved lock attached to the front of the barrel; in which the cock is seen *shut* and *locked*. A square hole being cut through the barrel and into the plug *a*, a moveable steady pin or bolt *b*, with a shoulder to limit its action, is fitted into it, passing through the barrel into the plug; the opposite end terminates in a screw, over which is a spiral spring resting on the shoulder; a turned brass socket *c*, having also a shoulder about midway to press upon the spiral spring, is then put over all, and secured to the barrel either by solder or screws; if by the latter only, the notches in the heads must be filed away, for obvious reasons. To open the cock, or rather to withdraw the bolt, the screwed socket key *d*, must be introduced; when about two turns will sufficiently compress the spring and withdraw the bolt, and the cock may then be opened and shut at discretion, while the screw key remains in the position we have just described. When the key is withdrawn it locks itself upon shutting the cock, by the action of the spring, which thrusts the bolt into the aperture of the plug.

After having attentively examined the subject, we are assured that our readers will agree with us that this pretty, ingenious contrivance of Mr. Russell's, for simplicity, durability, convenience and security, far surpasses all other inventions for the same purpose. It will be observed, that it cannot be opened from an impression taken of the key hole. An impression of the secured bolt must be obtained in order to make *tools* to make a key. The extreme difficulty of getting this impression renders it next to impossible; for, it must first be ascertained whether the screw bolt has a single, double, or triple thread, and whether the thread is fine, or coarse. It cannot be opened by any instrument applied to the end of the plug. The plug may be taken out, and the cock repaired (fresh ground) without unsoldering any part. By varying the diameter of the screwed bolt, and also the form of the thread, an infinite variety may be obtained. All liquor cocks, including those now in use, from the smallest wine cock, to the largest still or vat cock, may receive this security, which we understand has been already done in several large distilleries and brew-houses. In conclusion, we must not omit to mention the convenient portability of the key, which, for unlocking the largest cock ever made, does not exceed the size of those commonly used for small tea caddies.

TO DETECT POISON BY THE EAR.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"THE following notice being, as I conceive, not altogether irrelevant to the ostensible object of your Register, should you coincide with me in opinion, its insertion may be productive of some good, in contributing to the safety of our fellow creatures.

"To detect poison by the ear, when it assumes a similitude to a salutary and common medicine, and thus becomes the more obnoxious to a fatal result, is certainly an art, the knowledge of which cannot be too widely disseminated.

"The almost undistinguishable identity in appearance, at least to common and hasty observation, of that active mineral poison called oxalic acid and the common Epsom salts, we have had frequent and lamentable cause to deplore, from the numerous deaths which have been occasioned by the incautious, not to say criminal, neglect of certain druggists, who have been too much in the habit of intrusting ignorant or careless persons, and mere boys, with the dispensing of drugs to the public: to avert in some degree the danger of which, the following relation may contribute. A medical friend of mine having a short time ago occasion to dissolve some oxalic acid in water, had his attention excited by the very sensible *crackling* noise made by the crystals of this acid as they dissolved; and on near inspection, it seemed that every crystal made one distinct crackle before dissolution; as where three or four remained longer undissolved than the rest, they were each observed eventually, though at intervals, to go off in that manner. It struck him that this trifling circumstance might be turned to some good account, as a test of the almost latent property of a substance so closely resembling in exterior appearance the *sulphate of magnesia, alias Epsom salts,* it being observable that the *latter* are thus easily distinguishable, by their not producing *any noise* whatever when dissolving in water.

"Although the above fact may have been noticed by others, and known to many, yet inasmuch as its discovery was original, as regards the gentleman who made, and informed me of it; such may perhaps be deemed a sufficient apology, should one be necessary, for thus obtruding the subject on public attention. I am Sir,

"*June* 19, 1824. "Your's, &c. W. Y—D."

ON SHIP BUILDING.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"IN continuing my remarks from page 259 in your 17th Number, on the subject of building and repairing our men of war under cover (which is the sole cause of their going rapidly to decay, as will be found on further trials), I recommend the timber to be

well seasoned, before it is got up in its place under cover to build the ship ;—to erect large steam kilns, which can be got up at a very trifling expense ; and after the timbers are trimmed to their scantling, to put it into the steam kilns, and let it be steamed an hour for every inch the timber is thick. When it has stood its proper time in the kiln, take it out and let it cool for 48 hours, or longer ; (steam is supposed to be 800 times hotter than boiling water, and will fetch out all those sour juices from the timber which boiling-hot water will not not do) when exposed to the atmospheric air its pores close as it cools, and the moisture being entirely out of the timber, the timber is shrunk, as much as it ever will, becomes at once seasoned, and every day gets harder and firmer. A great deal has been said about the proper season for cutting down timber. I would not care what time of the year timber was cut down, if I was going to build a ship for my own use ; I would steam it, and build my ship in the open air, exposed to all kind of weathers for at least three winters. After this I would steam all my plank beams and knees, and when I began to build my ship up I would also char every bit of timber in the ship : then, as a finishing stroke, I would add my never failing remedy, which has had a fair trial 30 years ago : with this applied you would have no more rotten ships, but the timber would last as long as it does in houses, and keep perfectly sound for a vast number of years."

Mr. Carey then proceeds in his letter to inveigh against (what he calls) " *an improvement with a vengeance,*" which has lately obtained in the king's yards, of laying the gun-decks " athwart ships or in a diagonal manner," which he considers to be the offspring of " ignorance and inexperience," and to be " an outrage upon common sense ;" and that the consequence of this departure from the old-fashioned mode of laying the decks, must have a direct tendency to increase the difficulty of keeping out the water when a ship is strained in hard blowing weather : he calculates that in the deck of a man-of-war, so laid, there must be no less than 200 " buts" pressing against her side, and the same number on each side amidships, when it has " always been the study of the most experienced shipwrights to get as few buts in the deck as possible, more particularly against the side." Mr. Carey concludes his remarks by defying " all the shipwrights in the world to keep these decks from leaking in against the side," and observes, that the men must " lie wet in their hammocks"—the ship put into port, disabled, " with a sickly crew," &c. " Yours, &c.

" Bristol, June 24, 1824. " EDWARD CAREY."

We have received another letter from Mr. Carey relative to the strictures of " Patimirus," contained in our last, upon some former communications of his (Mr. Carey's), which he considers to be undeserving of attention, and concludes his letter by the following observations :

" I cannot make any other remark than that I think Patimirus had better confine himself to a subject that he may know more about.

I cannot understand his logic, therefore cannot enter into any argument with him, and must leave him in his crooked way; for I fear no argument will get him straight, he is so full of crooks and bends."

[For our own part, it appeared to us that Mr. Carey's observations upon the coppering of ships, were either distorted by Patimirus, or misunderstood by him; we allude to the effect which Patimirus stated would result from the manner of placing the dock-blocks. We have a great dislike to controversial correspondence, but we thought it right that both sides should be fairly heard.]

ON THE DURABILITY AND DECAY OF ENGLISH OAK TIMBER, &c.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Knightsbridge, June 18, 1824.

"SIR,

"I WAS much pleased with the remarks of your correspondent E. CAREY, in the 18th Number, as they coincide in a great measure with my opinion. We have a lesson from a wise man that there is a time for all things; but various are the opinions in respect to the proper time that trees should be cut down. Now it is a well known fact, that there is some English oak timber, of such a quality and hardy constitution, that neither time nor climate will cause any apparent decay, after having been a vast number of years in use, but seemingly as sound as it was at first. The more thriving a tree is when cut down, the sooner it decays (of which I mean to treat more fully). In order to find out durable timber, I have arranged the plan of a Register, to be kept in the form of a table, in which all the circumstances relating to a piece of timber may be readily stated, and in a few words; such as *when planted, the soil in which it grew, the situation, when cut down, whether a growing or living tree at the time, &c. &c.*—Information which might easily be obtained by some regulation with the grower or surveyor, and likewise by the consumer, or converter of the timber. We should thus very soon be able to detect the evil, and to arrive at a great deal of knowledge of the highest national importance. Then, and not till then, shall we know where to plant, and when to cut down to advantage. This is a mystery at the present time, but it was not the case 2,500 years back; for since I have suggested this idea, I have seen it on a record, from undoubted authority, that there were men at that time, that knew how to choose out a tree that would not rot. However we may have increased in knowledge in other things, in this point we have decreased. If this had not been the case, our forests would not present that scanty appearance they now do, and the national saving would have been immense. It would, however, be illiberal to blame any one for not putting this into practice, as it was perhaps never thought of. What I mean to treat on will be, not from fancy, but from above 40 years practice and experience in ship building. It will be on a new mode of converting the timber, which will not only

have the advantage of more durability and strength, but effect a great saving;—the external decay prevented, which is the forerunner and seed of the dry rot. No large expensive buildings need be erected, nor experiments be made to endanger mens' lives, but all can be accomplished without any additional expense whatever.

"I am, Sir,

"Your most obedient and humble servant,

"JOHN GREGORY."

AEROSTATION.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"I FEEL greatly obliged by the handsome manner in which you, in your last No. adverted to my poor notions on the subject of Aerostation, and for your liberal offer to afford them an engraved illustration. The expense, however, incident to this, would, I fear, be greater than I would be willing you should incur; and I have for that purpose endeavoured, in the following observations, to make myself more sufficiently intelligible, without involving trouble to you or further obligations to myself.*

"As the system of "*Ballooning*" has become rather popular just now, the public attention has naturally enough turned to it, and I amongst others have engendered two or three ideas upon the subject, which I will now state.

"It is allowed that the "*descent*" is the most dangerous part of the matter, and to obviate the difficulty, I would propose to fix to the car of the Balloon a wheel or roller, to which should be attached a rope or line, of about 100 yards long, terminating in the anchor, or grapple—this line being wound round the roller, as far as the grapple will permit, will of course remain inactive until the grapple fastens upon the ground, or any interposing object;—as soon, however, as this is the case, the line begins to unravel, and the rapidity of the Balloon is checked—but just inasmuch only as admits of a gradually retarding motion; whilst this is going on the gas continues to escape in such quantities as will take from the machine its motive powers. In order, however, to prevent the too great velocity of the roller on its axis, a spring, somewhat similar to a watch-spring, should be introduced, which would tend greatly to regulate the retarding power, and prevent a sudden jerk from detaching the grapple from its hold.

"It is a common thing for the Balloon to be drifted to a great distance, after the car has touched the ground, and if it strikes upon or against any interposing matter in its progress, much danger and inconvenience may occur, from the circumstance of its being dragged along upon its side, and consequently precipitating the persons and

* We have complied with our Correspondent's wish, from the idea (alone) that his expressions will be found sufficiently clear to reach general comprehension. ED.

things within it to the ground. Now, I think this can very easily be averted. Let the car be attached to a band, or ring, of wood or metal, acting freely upon two pivots, which ring shall be likewise attached to another interior ring, by means also of pivots, turning tranversely to the others,—similar to the apparatus in which the mariner's compass is fixed. The ropes being firmly fixed to the external of these rings, instead of to the car, will effect this object, viz.—That whatever course the Balloon may take, or however much it may be blown out of its perpendicular, the car will still retain its proper position, and prevent the consequences which else might arise.* "I am, &c. "G. L."

"*To the Editor of the Register of the Arts and Sciences, &c.*

"MR. EDITOR,

"SINCE aerostation is a subject that has lately engaged much public attention, permit me to add an observation or two, to insert in your next, from your correspondent "G. L." Those gentlemen who have lately tried their skill as aeronauts, betray a very dangerous ignorance of the use of the ballast with which they are provided. It should always be ascertained that the Balloon is able to ascend freely with the weight intended to be carried; but many of our modern aeronauts are obliged to throw out their ballast to increase the velocity of their ascent. Whereas, the ballast should be discharged, not in the *ascent*, but in the DESCENT; for if the aeronaut has thrown it out in the ascending, what is he to do to check the too rapid descent of his Balloon? How can he avoid falling on a house, on trees, in rivers? He should, therefore, look upon his ballast in the ascent as forbidden fruit, prudently reserving it, to avoid the serious and frequently fatal consequences of a precipitate descent.

"I should advise the ballast not to be put in bags at the bottom of the car, as too much time is required to discharge it; but the bags should be made in the shape of a night-cap, and fastened on the sides of the car, *inside*, in the same manner as the pocket on carriage doors. Then the aeronaut has only to lay hold of the truss at the end of the bag and to raise it up, when the contents will immediately fall over the car. If you deem these remarks worthy a place in your excellent work, you will, by inserting them, much oblige, Mr. Editor,

"Your obedient servant,

"July 6, 1824. "E. D. B."

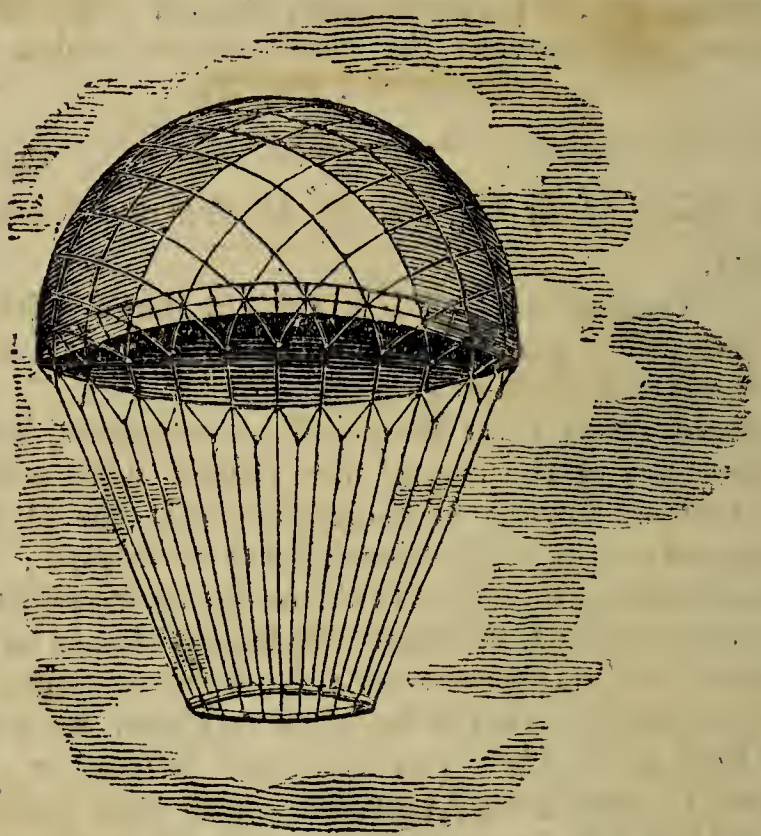
"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"OBSERVING in your last Number a drawing and description, by your ingenious Correspondent "L. H." of the Balloon and apparatus with which M. Garnerin ascended, a method occurred

* This expedient will have the effect of keeping the car in one position during its oscillating motion, and prevent a most unpleasant sensation.

to me by which the danger attached to the present system of aerostation might be greatly decreased. The reason that the Parachute is not at present in use I conceive to be not only on account of its weight, but also because of the inconvenience attendant on so long an appendage; according to a plan which I am now going to submit to you, the Parachute is combined with the Balloon, so as to add nothing to the bulk, and but little to the weight of the machine; it is as follows:—



"The Band which divides the upper hemisphere of the Balloon from the lower one, is to be formed of a wooden hoop, to which the net work which covers the upper hemisphere is to be firmly attached; the cords which descend from this hoop are to be fastened together in the usual manner below the Balloon, but not attached to the lower hemisphere; now if the upper hemisphere of the Balloon should burst, the gas would escape, the Balloon would begin to fall, and the lower hemisphere would immediately fall into the direction here represented, lining the upper one, and forming a complete Parachute.

"Should the lower part burst, the escape of the gas would not be so sudden as in the former instance, but when it had escaped, and the Balloon began to fall, it would immediately form itself into the same shape as before; in this latter case, it would perhaps be better to open the valve at the top, by which means the Balloon would be sooner formed into the shape of a Parachute.

"This is my plan, and it might perhaps by future improvements, which I would be very happy to see from any of your readers or correspondents, assist in rendering aerial excursions less dangerous than they are at present: it has these advantages over the common Parachute, viz.—1st. That of taking up less room: 2d. Being less

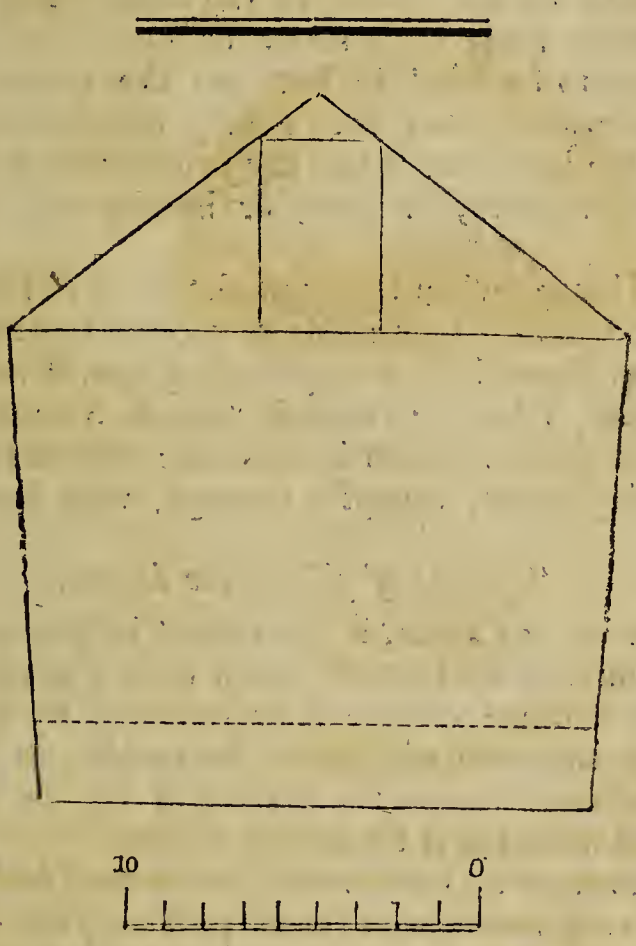
weighty: and, 3d. Not being subject to that great and sudden fall which must render the use of the common Parachute not only unpleasant, but extremely dangerous.

"Should this simple improvement, which is the result merely of theory and not of practice, be regarded as worthy a place in your Register, it is very much at your service.

"Your's, &c.

"W. L—y.

"Soho, June 30, 1824."



Scale, one-eighth of an inch to a foot.

ICE-HOUSES.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir,

"Knightsbridge, July 1, 1824.

"Observing in the last number of your Register an enquiry by B. R. relative to the construction of a cheap Ice-House, I beg to transmit you the account of a method which I have myself, and which, I understand, very many others have adopted. It is, I believe, an improvement upon the Italian and American plans, made by Mr. David Gordon.

"I am, Sir, &c.

"H. A. B."

"Dig a pit in the ground 12 feet deep, where water shall not remain after a heavy shower, and wide enough to permit the erection therein of a frame of rough wood posts. This frame to be 14 feet

wide each way at the bottom, and 16 feet each way at the top, conformably to the above sketch. The posts ought to be about 9 inches in diameter, placed near enough to each other for thin laths to be nailed upon them, and the inside dressed to an acute angle, so that as little wood as possible may touch the ice. On the inside let thin laths be nailed at about 2 feet apart,—on the outside, at moderate distances, nail rough boards, and fill the place within with wheat or rye straw set on end. The inside of the roof to be made in the same way, and also the gables. Straw to be sewed on the inside, and heath or straw on the outside of the door. The outside of the roof to be thatched thick with straw or heath, and heath, brushwood, or fir tops to be filled in between the outside boarding and the surrounding ground, and then neatly thatched or turfed over. The bottom of the house for 2 feet deep to be laid with large logs or stones, next with heath, fir tops, or brushwood, and then with straw.

"The Ice-House, when thus completed, will look like a square bee hive inverted, and is then ready to receive the ice or snow.

"Unless the House is in a very shady place, it may be necessary to extend the roof, where the door is placed, 5 or 6 feet, making a second gable and door, finished in the same way as the first, and fill up the intervening space, except a passage, with heath or straw.

"*Mode of filling the House.*

"When the ice, or snow, if ice cannot be procured, is put into the House, it must be well beaten down with a pavier's rammer, or mallet, and the surface *always kept concave*, by this means any snow or ice that may melt will run to the middle, or interstices, and freeze. For the same reason the surface of the ice ought always to be kept concave when ice is taken out for use.

"Should the frost be very intense, when the Ice-House is getting filled, it may be very beneficial at the close of each day's filling to throw in 30 or 40 pails full of water, which will fill the interstices and freeze.

"When the House is full, spread upon the *concave* surface a carpet, or sail, split up the middle, and put upon the top thereof a foot thick of straw.

"When ice is required for the use of the family, or when it is necessary to put in fresh meat to lie on the face of the ice for preservation, or to take out for use, the straw and carpet, or sail, to be opened at the middle.

"Should rats infest the place, an iron wire frame or case may be required to put the meat or fish, &c. into, when lying on the ice.

"A small open surface drain ought to be dug round the House, to prevent any water running into it.

"Opening the door of the House does little harm. Damp or dense substances touching the ice is much more prejudicial than dry air."

THE ELEMENTS OF NATURAL PHILOSOPHY,

No. 14.—Optics.—Of Reflection.

(Continued from page 298.)

When a ray of light falls upon any body it is *reflected* or thrown back, so that the *angle of incidence* is equal to the *angle of reflection;* and this is the fundamental fact upon which all the properties of mirrors depend. According to the inclination of the surface upon which a ray of light falls so will be the line of its reflection. When parallel rays fall upon a concave mirror (which is not transparent, but has only the surface of a clear polish) they will be reflected back from that mirror and meet in a point at half the distance of the surface of the mirror from the centre of its concavity; for they will be reflected at as great an angle from the perpendicular to the surface of the mirror as they fell upon it with regard to that perpendicular; but on the other side of it.

When an object is more remote from the mirror than its centre of concavity, the image will be less than the object, and between the object and the mirror; when the object is nearer than the centre of concavity the image will be more remote and bigger than the object; for as the object recedes from the mirror the image of it approaches nearer to it; and as the object approaches nearer to the mirror the image recedes farther from it, on account of the lesser or greater divergency of the pencil of rays which proceed from the object, for the less they diverge the sooner they are converged to points by reflection; and the more they diverge the farther they must be reflected before they meet.

If the radius of the mirror's concavity and the distance of the object from it be known the distance of the image from the mirror is found by this rule:—Divide the product of the distance and radius by double the distance made less by the radius, and the quotient will be the distance required.

If the object be in the centre of the mirror's concavity the image and object will be coincident and equal in bulk.

If a man place himself directly before a large concave mirror, but farther from it than its centre of concavity, he will see an inverted image of himself in the air between him and the mirror of a less size than himself. And if he hold out his hand toward the mirror the hand of the image will come out towards his hand and coincide with it of an equal bulk, when his hand is in the centre of concavity, and he will imagine he may shake hands with his image; yet a by-stander will see nothing of the image because none of the reflected rays that form it enter his eyes.

Let a fire be made in a large room, and a smooth mahogany table be placed at a good distance near the wall before a large concave mirror, so situated that the light of the fire may be reflected from the mirror to its focus upon the table; if a person stand by the table he will see nothing upon it but a long beam of light; but if he stand at a distance towards the fire, not directly between the fire and the

mirror, he will see an image of the fire upon the table, large and erect: and if another person who knows nothing of the matter beforehand should chance to come into the room and should look from the fire towards the table, he would be startled at the appearance; for the table would seem to be on fire. In this experiment there should be no light in the room but what proceeds from the fire, and the mirror ought to be at least fifteen inches in diameter.

If the fire be darkened by a screen, and a large candle be placed at the back of the screen, a person standing by the candle will see the appearance of a fine large star, or rather planet, upon the table as bright as the planets Venus or Jupiter.

Take a glass bottle, fill it partly with water, and cork it in the common manner; place this bottle opposite a concave mirror and beyond its focus that it may appear reversed; then place yourself still farther distant than the bottle, and it will be seen in the air inverted, and the water which is actually in the lower part of the bottle will appear to be in the upper.

If you invert the bottle whilst before the mirror the image of the water will appear in the lower part of the bottle, when it is in this inverted state uncork the bottle, and whilst the water is running out the image is filling; but as soon as the bottle is empty the illusion ceases. If the bottle be likewise quite full there is no allusion. The remarkable circumstances in this experiment are: 1.—Not only to see an object where it is not, but also where its image is not. 2.—That of two objects which are really in the same place, as the surface of the bottle and the water it contains, the one is seen in one place, the other in another. It is supposed that this allusion arises partly from our not being accustomed to see water suspended in a bottle with the neck downwards, and partly from the resemblance there is between the colour of the air and the water.

Focal Distance.—The focal distances of lenses are easily discovered by experiments, and, among others, we have selected the following:—

1.—When the focal length of the lens does not exceed two or three feet, it may be found by holding the lens at such a distance from the wainscot, opposite a window sash that the image of the sash may be distinct upon the wainscot; and this distance may be considered as the focal length of the lens; but if the focal length is great, the focus must be computed by the subsequent rule.

Rule. Measure the distance between the lens and the object and also from the image; multiply these distances together and divide the product by their sum; the quotient will give the focal distance: or, the square of the distance of the observed focus, divided by the distance of the object from the image will give the excess of the observed focus beyond the true focal distance.

2.—When you find the focus by making a candle the object:—To do this, move the lens on the candle and the paper for receiving its image, so that when the image is most distant the lens may be exactly between the other two, then halve the distance between the object or its image, and the lens is the focal distance.

3.—If a small hole, about one-fourth or one-eighth of an inch be made in the window shutter of a darkened room, and a lens and piece of paper be held behind this hole at proper distances, the place where the image of the hole is most distinct may be determined very critically, and from them the focal length may be found by the foregoing rule.

4.—By the sun's image: Place the lens so that its axis may point as near as possible to the sun; then holding a paper opposite thereto, the burning point, or where the image of the sun is smallest, and the limb most distinct is the focus. This method is sufficiently accurate for spectacle glasses, and such as are broad in proportion to their focal length; but will not answer for lenses of a long focus, unless they are sufficiently long to exhibit the solar spots; because in these cases the image is only a glare of light without distinctness; but the inconveniences may be removed by the following method:

5.—Cover the lens with a piece of pasteboard or paper, and make two round holes therein at an equal distance from the edge of the lens and on one of its diameters. The lens being thus covered, point its axis to the sun: now if a paper be held behind the lens you will find the two circles, or white spots, produced by the two holes, gradually approach nearer to each other as the paper is moved further; at last they will unite, and if the paper be moved still further they will again separate. The distance of the paper from the glass when the circles unite being measured gives the focal distance.

(To be continued.)

MISCELLANEOUS INTELLIGENCE.

Mr. Lowry, the Engraver.—The death of this celebrated artist has been announced in the papers, and the event cannot but grieve every friend to science and the arts. In the mechanical part of the art of engraving he was unequalled, and those who from their studies have been accustomed to his illustrations in scientific works will indeed deplore the loss of his extraordinary talents. The beauty, clearness, and precision of his graver, rendered doubly delightful the study of the subjects upon which it was employed, and he has been justly termed the father and founder of this branch of art. Himself eminently skilled in practical knowledge, few persons could be found so qualified to the peculiar task upon which he was engaged, and those who have been accustomed to reap the advantage of his advice and assistance will sustain a loss not easily to be repaired. It is said that as a mineralogist he had few equals.

New Steam Vessel.—An American paper puts forth the following intelligence. "A small steam vessel the machinery of which, furnace and all, occupied only three feet in length and two and a half in width, and *without a boiler*, was witnessed on the 10th ult. at Philadelphia driving a common ferry-boat with twelve passengers at the rate of eight miles an hour. It is the invention of Mr. Hawkins, and if the cylinder which is only *seven inches in height* had been a

foot higher, it is said that the power would have been doubled. It is proposed to call this mode of navigation the 'Steam boat Safety,' not being liable to bursting or scalding."

Mineral Tallow.—Specimens of this substance was lately found in a bog on the borders of Loch Tyne. This curious mineral was first observed by some peasants on the coast of Finland, in 1736; afterwards it was found in one of the Swedish lakes. A similar substance was found at Strasburg by Dr. Herman, and in this country by Professor Jameson. It is insoluble in water, soluble in alcohol, olive oil, and oil of turpentine, whilst the liquids are hot,—but is precipitated on cooling. It does not combine with alkalies and form soap. It has the colour and feel and taste of tallow, but without smell. It is as volatile and combustible as any of the volatile oils or naptha.

Aerolite.—An Aerolite fell at Nobleborough Maine, U. S. on the 7th of August, ——. The following account of which was given by a Mr. Dinsmore, who observed the phenomena. Mr. Dinsmore's attention was first excited by hearing a noise which resembled the discharges of platoons of soldiers, but soon became more rapid in succession. The air was perfectly calm, and the sky was clear, with the exception of a small whitish cloud, apparently about forty feet square, nearly in his zenith, from which the noise seemed to proceed. After the explosion, this little cloud appeared to be in rapid spiral motion downwards, as if about to fall on him, and made a noise like a whirlwind among leaves. At this moment, the stone fell among some sheep, who were thereat much frightened, jumped, and run into the woods. This circumstance assisted Mr. Dinsmore in finding the place where the stone struck, which was about forty paces in front of the place where he was standing. The Aerolite penetrated the earth about six inches, and there meeting another stone was broken into fragments. When first taken up, it exhaled a strong sulphureous smell. The weight of the whole mass, previous to the fracture was from four to six pounds.—*Silliman's Journal.*

Atar of Roses.—This precious essence is easily obtained, provided the material is supplied in quantities sufficient for the purpose. One hundred weight of roses generally yield from two to three ounces of Atar. The roses, with their calyxes, are to be immersed in double their weight of water, and to be distilled by a very gentle heat, from which will be obtained a strongly-scented rose wine. This to be cooled as quickly as possible, by the night air, and the globular particles found upon its surface are to be carefully gathered the next morning, which are more or less abundant, according to the quality of the roses. It is said that a peculiar fragrant grass is employed abroad, along with the roses, besides other odorous vegetable substances; but although the quantity of essence is thereby increased, its quality is considered to be deteriorated. After the Atar has been gathered, the rose water that remains is powerfully scented. There is no necessity for distilling the roses immediately after they are gathered, as that may be inconvenient, particularly on account of the heat of the weather when the flower is produced. Rose leaves, as

well as other flowers capable of affording fragrant essential oils, may be preserved for a long period, without losing any of their odour by being well rubbed and mixed into a paste with common salt. It is even said that the quantity of oil and water is greatly encreased by the salting process, which is indeed very probable. The proportion of salt is one pound to three pounds of leaves. The flowers being bruised by the friction of the grains of salts form a paste, which is to be preserved in an earthen jar or a water-tight barrel; continuing the process uniformly until the barrel or jar is filled, which may be kept in a cool place for several years, without impairing its flavour or strength. This aromatic paste may be distilled at any season of the year, mixing it with about twice its weight of water before it is put into the still.

Mode of securing a good Produce of Cauliflower Plants during the Winter, by Mr. G. Cockburn.—"I sow the seeds of the early Cauliflower in a south border, in the beginning of July, and as soon as the plants come up, I thin them out to twelve or fourteen inches apart, where I suffer them to remain, keeping them clean, and watering them occasionally, till about the middle of November, by which time they all produce heads from ten to thirty inches in circumference. As they are not hardy enough to bear more than three or four degrees of frost, I remove them at that time into a shed, which will keep out ten degrees of frost, taking care to retain as much mould about their roots as possible, and to remove all their decayed leaves. In the shed they are planted in mould, keeping a space of about an inch between each head. In this state they are frequently looked over with care, their dead leaves removed, and those heads cut for present use which shew any disposition to decay. When severe frost occurs, the plants are covered with dry short hay. By this management I have been able to send three dishes of cauliflowers to the table every week, during the autumn and winter until February.—*Transactions Horticultural Society*.

Turnpike Roads.—A statement has been made public, by which it appears that there are 18,329 miles of *Turnpike Roads* in England, 2,591 do. in Wales, and 3,611 in Scotland,—total, 24,531.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

HOSE FOR FIRE ENGINES, BREWHOUSES, &c.——To the person who shall invent and make known to the Society a method of making hose for fire engines, brewhouses, &c. similar to those used on the Continent, made of flax or hemp, or other flexible material, cheaper than leather.—The Gold Isis Medal, or Thirty Guineas.

PREVENTING THE WATERING OF PLAIN SILKS.—To the person who shall invent a method of preventing plain silks from being watered in the loom, without the use of a knee-roll.—The Silver Medal, or Fifteen Guineas.

PREVENTING PREJUDICIAL EFFECTS TO THE PERSONS EMPLOYED IN DRY-GRINDING.—To the person who shall invent and produce to the Society a mode of obviating the prejudicial effects that attend the operation of pointing needles, and other branches of dry-grinding, during which the particles of grindstone-dust, steel, and iron, being thrown into the air, and received with it into the lungs, occasion asthma, consumption, and other painful disorders.—The Gold Medal, or Thirty Guineas.

DESTROYING THE FLY ON HOPS.—To the person who shall discover to the Society an easy and efficacious method of destroying the fly on hops, superior to any hitherto known. The Gold Medal.

RECENT PATENTS.

To WILLIAM CLELAND, of Leadenhall-street, London, gentleman, for an improvement in the process of manufacturing sugar from cane-juice, and in the refining of sugar and other substances. Dated May 6, 1824.

To ARCHIBALD BUCHANAN, of Catrine Cotton-works, one of the partners in the house of James Finlay and Co. merchants at Glasgow, for an improvement in the construction of weaving-looms impelled by machinery, whereby a greater quantity of cloth may be weaved in a given time, without injury to the fabric, than by any application of power for that purpose heretofore employed. Sealed at Edinburgh, October 10, 1823.

To JOSEPH ROGERSON COLLIER, of Castle-magna, near Mallow, Cork, clerk, for cer- improvements in wind musical instruments. Sealed at Edinburgh, December 4, 1823.

To JOHN HOLT IBBETSON, of Smith-street, Chelsea, Middlesex, esq. for certain improvements in the production or manufacture of gas. Dated May 15, 1824.

To THOMAS PARKIN, of Bache's-row, Middlesex, merchant, for certain improvements in machinery, or apparatus, applicable to, or employed in, printing. Dated May 15, 1823.

TO OUR READERS AND CORRESPONDENTS.

The subject alluded so by S. C. E. is not altogether within the pale of our plan.

N. H. is informed that we *have* seen the machine, but that we are not yet permitted by our friend to give it publicity.

T. R. thinks we should have quoted Capt. Beaufoy's account of his aerial voyage—we are well pleased to give any new information we can upon a subject of this kind, but it having appeared in all the newspapers, we conceived that it would but trench upon other matter.

We have received the letter of "one hard of hearing," desiring to know the precise form of Dr. T. Morrison's Ear Trumpet, of which a brief account appeared in an early No. of the Register. We should describe it as a cylinder, 1 inch in diameter and 3 or 4 inches long, each end of which has another piece soldered on, expanding to a much greater diameter, forming bell-shaped ends—one to receive the sound, the other the whole of the ear. That we may not be misunderstood, we will send a sketch of it to our publisher's, for our correspondent's inspection.

We are sorry we cannot oblige C. R. W. with the information he requires; —we are precluded from adding more on the subject at present.

T. W. Ego—N. N. E. E. F. N. Osric and H. R. have been received.

Mr. P.'s note (from Bury) we have received, and we wish him success in his undertaking.

We think it unnecessary to furnish our readers with an account of what passed in the Court of Chancery on Friday the 2d instant, on the application made by Mr. Wm. Newton to restrain us from publishing certain engravings contained in our 16th Number,—further than to state that the accounts which appeared in the newspapers were substantially correct, and that the motion was dismissed with costs! Our readers may depend upon our proceeding fearlessly and faithfully to supply them with every information in our power relative to Patents and Patent-rights, in spite of threatened Chancery suits or assumed monopolies:—we do not desire to deprive others of their rights, and we will never submit to be deprived of ours, more especially when the public interests are involved.

[*To be continued every* FORTNIGHT.]

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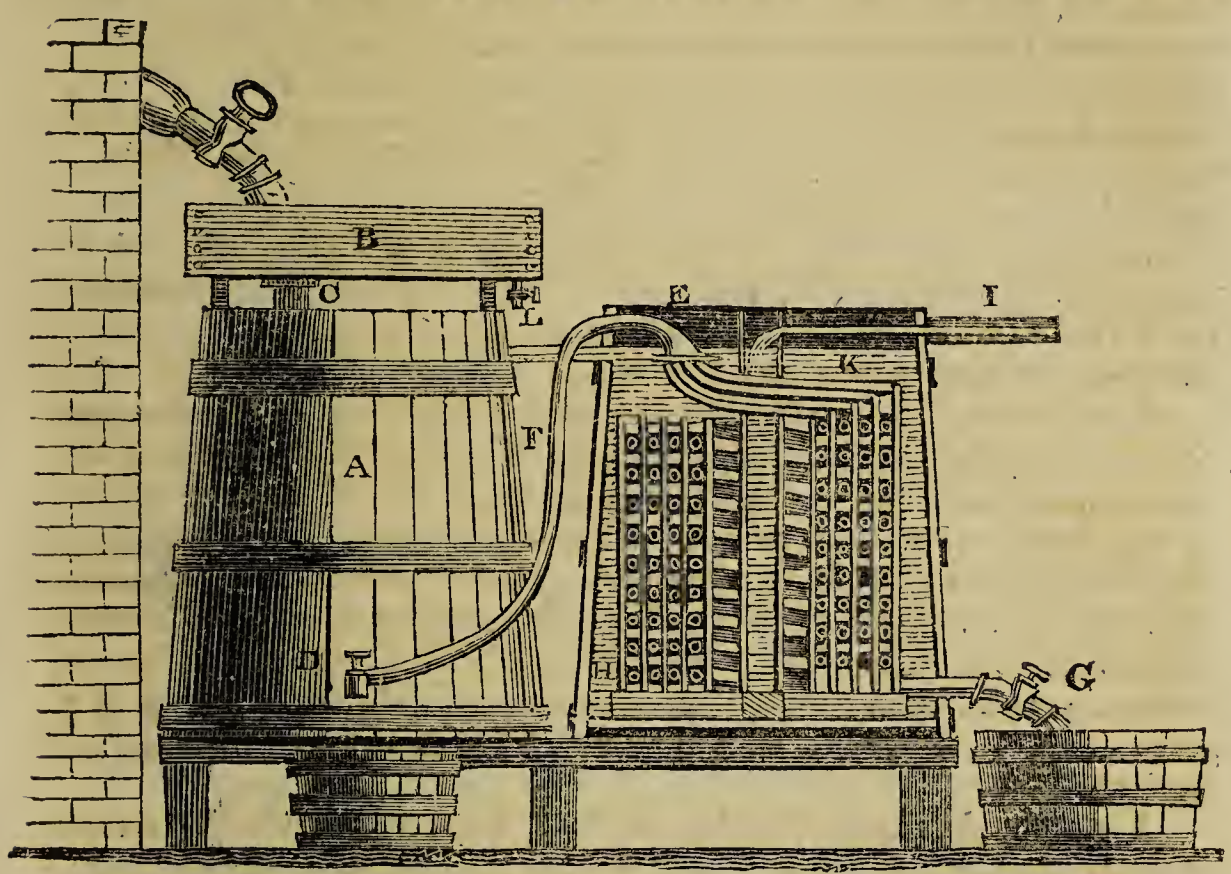
REGISTER

OF

THE ARTS AND SCIENCES,

IMPROVEMENTS & DISCOVERIES.

No. 21]. SATURDAY, JULY 24, 1824. [Price 3*d*.



MR. BUNDY'S PATENT ANTI-EVAPORATING COOLERS

FOR REFRIGERATING WORTS, IN ALL SEASONS OF THE YEAR, FROM ANY DEGREE OF HEAT BELOW BOILING TO THE TEMPERATURE FOR FERMENTATION.

In the process of brewing, it is considered essentially necessary (particularly in hot weather) to cool the wort down to the proper temperature for fermentation as quickly as possible, immediately it proceeds from the copper; to effect which the wort is usually run into very wide and shallow wooden vessels, called coolers, in order to expose an extensive surface of the liquid to the air. Now, by this highly defective and unscientific mode of cooling, it must be evident, that a great proportion of those volatile principles, upon which depend the good quality and strength of the liquor, must evaporate, and be lost. By Mr. Bundy's ingenious invention, however, those valuable volatile properties are entirely preserved; the operation is performed in a few minutes, instead of lasting several hours; and the space or room required for conducting the process need not be more than a tenth part of the usual extent.

The value and importance of this apparatus, for the public or private brewing of all kinds of fermentable liquors, must be so apparent

from these considerations, that we shall abstain from further remark on that head, and proceed to the description of its mechanical construction.

A, is a tub filled with cold water, in which is fixed a series of metal pipes capable of cooling a certain quantity of wort per hour, according to the size of the apparatus. The wort may be let to run either direct from the boiler into the hop back B, or (as convenience may permit) be ladled into B, after straining from the hops. The wort then passes from B through the main conducting pipe C, into the series of pipes, and is delivered out through the cock D into the gyle tun; adjusting the quantity by opening the cock more or less, by which means the heat of the wort may also be regulated, so that it may run out at the proper temperature for being immediately fermented.

The other vessel H, is a longitudinal section of a precisely similar vessel and apparatus as A, and consequently exhibits a section of all the series of pipes, their spiral winding and situation. Now, if instead of drawing the wort off at D, as beforementioned, that cock were kept shut, the wort would flow out of the first series of pipes contained in the vessel A, into the pipe F, and there ascending to its level, it would descend and be distributed into the second series of pipes at E, contained in vessel H, which being kept constantly filled with cold water, condenses the vapours, while it rapidly cools the liquid wort, in its extended circuitous passage through the convoluted series of pipes, till it is discharged at the cock G; where it arrives, properly refrigerated, in more than double the quantity in a given time, than would be delivered at D, if the vessel A alone were used.

A continual supply of cold water is indispensable, which may be pumped into the tub H, by passing along the shoot I, and descending by means of the trunk K, to the bottom, which being left open, drives the water, that has been made warm by the wort in the pipes, to the upper part of the vessel; from whence it flows by the shoot L into the trunk of the vessel A, which is similar to that in H. By these means, the water which is driven off at the top of the tub A, is much hotter, and consequently has deprived the wort passing through the pipes of much more heat than in the case of the single tub A being used. When the tub A is sufficient alone, for the purpose required, the cold water is then, of course, to be pumped into the shoot L.

We understand that this apparatus may be seen at work every day, between the hours of 11 and 1, at the manufactory, No. 147, Tottenham Court-road.

IMPROVEMENT OF TILES AND BRICKS.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"THE following account is translated from a Russian periodical of the year 1822; if you think it worthy of a place in your valuable Register it is at your service.

"The inventions of M. de Chomas for the improvement of tiles and bricks are as follows:

"1. A machine for converting every species of clay immediately on being dug up from the pit into tiles or bricks. 2. A furnace for burning tiles or bricks to the consistency of iron, with a saving of one-third of fuel. 3. A press, with which three or four people may form from between 10 to 12,000 tiles or bricks in one day. This press furnishes the bricks or tiles in almost a dry state, perfectly free from cracks, and perforated with holes, in order to promote the drying, and to give the cement a better hold of them; while, by a very simple apparatus, it may be so adjusted as to give the bricks or tiles any shape that may be desired; such as bent bricks for vaults or furnaces, or tiles for ornamental purposes. The tiles join, and, with the inventor's cement, are more durable than iron, by three-fourths less expensive, and never require being varnished. M. de Chomas having submitted his inventions to an Imperial commission, has obtained a patent for them for ten years. He is willing, however, to make his inventions universal, on conditions which he will shortly publish. I have not seen these conditions, nor have I been able to learn any particulars concerning these inventions: should, however, any of your numerous readers, a communication of them would, without doubt, be gratefully received by the public, and especially by

"Your humble servant,

"Y. Z."

ON THE VALUABLE PROPERTIES AND IMPORTANT USES OF THE FARINA OF POTATOES.

"*To the Editor of the Register of the Arts and Sciences, &c.*

Pimlico, 18th June, 1824.

"Sir,

"Being a reader of your interesting little publication, my attention was much taken up by the account in your last number* of a very complete machine for reducing potatoes to a pulp, together with the process for separating the farina; and from experiments that I have myself made, I am quite satisfied with the efficiency of the machine, as well as the judiciousness of the process recommended. Being a member of the Society of Arts, I have referred to that volume of their "Transactions" which contains a description of Mr. Whately's machine for the same purpose; and I find upon comparison that the resemblance between them is very striking, although that invented by your correspondent is decidedly superior, which is chiefly owing to the cylinder revolving in water. The account given of Mr. Whately's apparatus in the Society's "Transactions" is, however, accompanied with some valuable communications on the culture of potatoes, as well as the important uses to which the farina may be employed, for which Mr. Whately was de-

* The last number but one, No. 18. The date of the above letter, which we had not room for the insertion in our last, explains this.

servedly presented with the Society's gold medal, and to afford your readers a portion of the important and useful information contained in these papers, is the object of my letter.

"It may not be generally known, but it is capable of the most satisfactory proof, that the same quantity of land will yield above one half more of farina, or flour, where potatoes are cultivated, than if the same land was applied to the production of flour from wheat.

"I have proved from experiment, that 2619 pounds of pure farina, or flour, may be produced from an acre of land, planted with potatoes; and only 1600 pounds of flour from an acre of wheat. It will, therefore, be obvious, that if we can apply this great excess to the same purposes as the flour of wheat, the advantages arising from it will be of the highest importance to the community. We now require from foreign countries about 500,000 quarters of wheat annually; for which we incur an expenditure of about two millions sterling in ordinary years; and which has increased, in years of scarcity, to upwards of seven millions sterling; and there seems no probability that under the continuance of the present system of cultivation, we shall ever arrive at the period when we can supply our own wants, and feel independent of foreign aid for one of the first articles of subsistence. This, then, is one of the advantages that would attend the consumption of potatoe flour in bread; the earth yields it so abundantly, that the very first year's cultivation of potatoes for that purpose, to the extent of only 25,000 acres, would relieve us from the necessity of any foreign importation; and instead of importing, we should speedily become an exporting country.

"It is well known that poor light soils, unfit for the culture of wheat, and from which only crops of barley or oats have been produced, and of which, in many situations, there are large tracts of land altogether uncultivated, will produce potatoes of excellent quality. Two circumstances have, however, hitherto prevented their culture, to the desirable extent; namely, the great expense of their carriage, in a raw state, from the interior parts of the country, to a proper market: and their not keeping well more than six months after the crop is gathered. These inconveniences I have obviated, by the invention of a machine now in the Society's house, by which one person can grind down 1700 pounds net of potatoes into a soft pulp in one day, yielding about 240 pounds weight of the farina, or flour, when dried. By calculation, the power of a single horse will be equal to the grinding of twenty-two tons of potatoes in a week; the machine is likewise capable of being applied to any power or first mover required.

"Thus by the application of very cheap, simple, and efficient machinery the produce may be reduced to about a seventh part of its bulk, which would render the carriage to market an inconsiderable expense; and that seventh part consisting only of the farina (which is pure starch), is even more valuable than the total produce, as it contains nearly all the nutriment of the vegetable, is much purer and more wholesome (as the potatoe in the natural state contains some noxious qualities), and may be kept undeteriorated for an unknown

number of years. It appears likewise that potatoe flour may be produced, on the large scale, at about one half the cost of wheat flour. One fifth part of potatoe flour with four fifths of wheaten flour makes most excellent light bread, the introduction of which generally would be attended with the greatest benefit to the nation, and would produce a saving, according to Mr. Whately's calculations, of two millions of quarters of wheat per annum.

(To be concluded in our next).

" *To the Editor of the Register of the Arts and Sciences, &c.*

" SIR,

" I HAVE often remarked the loss of time and great inconvenience which bricklayers and others have experienced in tying ladders together by ropes, in order to increase the length; and it has occurred to me, that if when these ladders were made they were furnished with strong flat iron hooks and eyes, an immense deal of trouble would be saved, with little increase to the first cost. By this means the labourer would have nothing to do but to place the ladder having the iron shoulder, into the other made to receive it, and (any number of these things being placed at alternations in each ladder), the length might be immediately increased at pleasure.

" Should the above idea be deemed a hint worthy of the attention of the ladder-makers, you will perhaps be so good as give it a place in your excellent little work.

" I am, &c. " L."

AEROSTATION.

" *To the Editor of the Register of the Arts and Sciences, &c.*

" SIR,

" EVERY thing relating to Balloons being now in such vogue, that even the children in the streets have relinquished their kites for them, I send you the inclosed account of a voyage across the Dover Straits. It is from a weekly work which was started five years ago, and was soon defunct.

" Your's, Mr. Editor,

" 12*th July*, 1824. " B. L. M. E."

" ' AERIAL VOYAGE OF MR. BLANCHARD AND DR. JEFFERIES, ACROSS THE STRAITS OF DOVER.

" ' This voyage took place on the 7th of January, 1785. The morning was clear and frosty, with a wind that was barely perceivable, at N. N. W.

" ' At one o'clock the boat was pushed off from one of the cliffs. As the balloon however, was barely sufficient to carry two, they were immediately obliged to throw out all their ballast, except three bags of ten pounds each: they now rose gently, but made very little way,

having hardly any wind. The barometer, which on the cliff had been at 29.7 inches, was fallen to 27.3, and the weather proved fine and warm. They had now a most beautiful prospect of the southern coast of England, and were able to count thirty-seven villages upon it. After passing over several vessels, they found that the balloon, (within ten minutes of two o'clock,) was descending: upon which they threw out a sack and a half of ballast, but it still descended, and with greater velocity than before: they now threw out the remaining part of the ballast. This, too, proving ineffectual, they threw out a parcel of the books, which made the balloon ascend, when they were about mid-way between France and England.

"'At a quarter past two, finding themselves again descending, they threw away the remainder of their books, and in ten minutes after, they had a most enchanting view of the French coast. Still, however, the balloon descended; and as they had now no more ballast, they were obliged to throw away their provisions, the wings of their boat, and every thing they could possibly spare. 'We threw 'away (says Dr. Jefferies) our only bottle, which, in its descent, cast 'out a steam-like smoke, with a rushing noise; and when it struck the 'water, we heard and felt the shock very perceptibly on our ear and 'balloon.' All this proving insufficient to stop the descent of the balloon, they next threw out their anchor and cords, and at last stripped off their clothes, fastening themselves to certain slings, and intending to cut off the boat as their last resource.

"'They had now the satisfaction, however, to find that they were fast rising; and as they passed over the highlands of Cape Blanc and Calais, the machine rose very fast, and carried them to a greater height than they had been at any former part of their voyage. They descended safely among some trees in the forest of Guiennes, where there was just opening enough to admit them."

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"*London, July* 14, 1824.

"SEVERAL tracts having lately appeared in your useful Register respecting Aerostation, I venture to transmit a plan for the construction of Balloons, which, I trust, will at least be a considerable improvement on the score of safety.

"Let a Balloon be divided by vertical sections like an orange, into four, six, or eight compartments, in such a manner, that if one or even two burst, and lose their gas, the rest from which it could not escape still containing a great quantity of this light fluid, would either continue to buoy it completely up in the air, or at worst occasion its descent to be so very gradual, as to secure the aeronauts against all danger. Each of these compartments might have a separate small valve to let out the gas from it at pleasure, and one of larger dimensions could be placed on the top, with which every compartment should have a particular communication, so as on being near or

touching ground, to allow all the gas to escape at once from the Balloon. In placing the partitions between the several compartments, instead of making them perfectly tight, let them be rather slack; by which means should one of these compartments by accident receive a rent and lose a portion, or the entire of its gas, the two adjoining ones would instantly project (in globular forms) to fill up partially the interval, and consequently in a great degree exclude the external air.

"The first object in all philosophical experiments should be the preservation of lives; with this view, as a duty to mankind, I have ventured, off-hand, theoretically, the foregoing suggestion for practical aeronauts; and should it fortunately be deemed worthy attention, I may hereafter transmit for another number of your pamphlet, what I conceive to be a second improvement, not being as yet altogether prepared for explaining it; this is to raise or lower Balloons upon mathematical principles by entirely a new method; without the assistance of cumbersome ballast, which once thrown out cannot be recovered.

"I remain, Sir, your's, &c.

"M. P."

MR. BEVAN'S EXPERIMENTS ON THE ADHESION OF NAILS IN WOOD.

The following table exhibits the relative adhesion of various kinds of nails when driven into dry Christiana deal, at right angles to the grain of the wood.

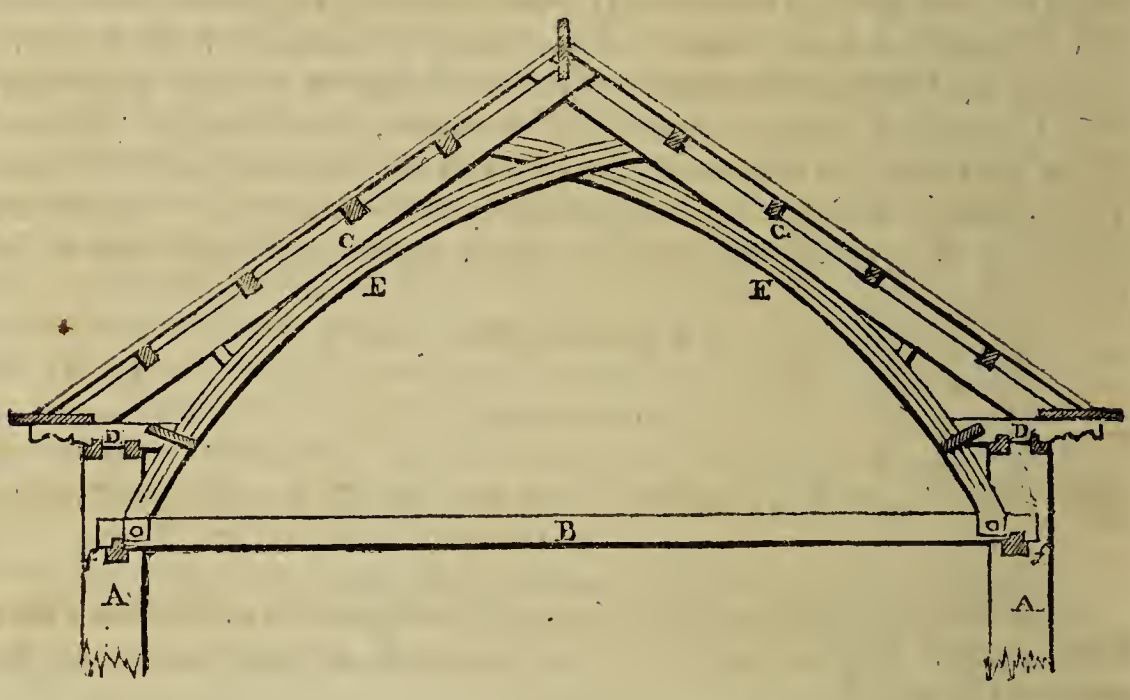
	Number to the lb. avoirdupoise.	Inches long.	Inches forced into the wood	Pounds required to extract.
Fine sprigs	4,560	0.44	0.40	22
Ditto	3,200	0.53	0.44	37
Three-penny brads	618	1.25	0.50	58
Cast-iron nails	380	1.00	0.50	72
Six-penny nails	73	2,50	1.00	187
Ditto	—	—	1.50	327
Ditto	—	—	2.00	530
Five-penny nails	139	2.00	1.50	520

The percussive force required to drive the common sixpenny nails to the depth of $1\frac{1}{2}$ inch into dry Christiana deal with an iron weight of about $6\frac{1}{4}$ lbs. was four blows falling freely the space of twelve inches, and the steady pressure required to produce the same effect was 400 lbs.

A sixpenny nail driven one inch across the grain into dry elm required 327 lbs. to extract it; driven endways, or longitudinally, it required 257 lbs. for its extraction: driven endways two inches into Christiana deal, it was drawn out by a force of 257 lbs.; but driven in one inch only in the same direction, it was extracted by 87 lbs. The relative adhesion, therefore, when driven transversely or longitudinally, is as 100 to 78, or about 4 to 3, in dry elm; and as 100 to 46, or as 2 to 1, in deal.

To extract a common sixpenny nail from a depth of one inch out of dry oak required ..... 507 lbs.
Dry beach ..... 667 lbs.
Green sycamore ..... 312 lbs.

A common screw of 1-5th of an inch diameter was found to have an adhesion about three times that of a six-penny nail. The resistance to the entrance of a nail was found to be to that of extraction, in some experiments, as 6 to 5.



AN IMPROVED CONSTRUCTION OF A ROOF, BY A. H. HOLDSWORTH, ESQ.

(From a Correspondent.)

"To the Editor of the Register of the Arts and Sciences, &c.

"SIR,

"CONCEIVING that every improvement of importance in house-building, must necessarily be of some interest to the majority of your readers; and being desirous of contributing my feeble aid to the support of your valuable little publication, I send you a sketch of an improved form of Roof, invented by A. H. Holdsworth, Esq.; for which that gentleman received the large silver medal from the Society of Arts. As an Account of this invention is given in 'The Transactions of the Society,' in Mr. Holdsworth's own words; I shall avail myself of his observations in the description of it.

"The advantages which this method affords, are the saving of a considerable proportion of the timber usually employed, and the gaining for useful purposes the whole space that is contained within the roof. Mr. Holdsworth constructed a roof of this kind over the dwelling-house of a friend of his, and notwithstanding his walls were only six feet above his upper floor, he has obtained in consequence good lofty rooms, whilst the outside of his house appears very low; his barns, hay-lofts, &c. are built on the same plan.

" A, A, represent the walls of the house, and B one of the timbers of the uppermost floor, resting on the sleepers *f f*, which are let into the wall; over two other sleepers laid in the top of the wall are fitted two pieces of wood D D. The principal rafters C C, forming each pair, are then secured at the bottom, into the pieces D D, and are fastened to each other at the top by iron pins. Each pair of the principal rafters C C, is supported by two arch pieces E E; these pieces are *in their grain*, and are formed on the plan recommended by Mr Hookey, of the king's yard, at Woolwich, to whom the country is so much indebted for this method of converting the timber. They are cut lengthways, by a saw, into three pieces, to within two feet of one end, are then placed in a steam kiln, and boiled until they will bend freely, when they are fixed to a mould, and left to cool, after which a few pins of woods are driven through them to keep the pieces so cut from again flying open. The arch pieces will get a little out of shape when taken from the mould, but will be easily brought back, and when secured under the principal rafters, will fit the more firmly. The lower end of these arch pieces are inserted in the beam B of the floor, and therein firmly pinned, while at the top they cross one another, and each butts against its opposite rafter. They are further secured by iron straps to the short pieces D D, on which the principal rafters rest, thus preventing the latter from sinking and thrusting out the walls, and making the whole a stiff and complete framing, on which the longitudinal rafters, and transverse pieces are fastened in the usual manner. *

" The roofs of barns or other buildings that have only a ground floor, may be constructed in the same way, care being always taken to bring the feet of the arch-pieces so far down the wall as to give them a firm bearing.

" Mr. Holdsworth having already constructed several roofs of great widths on the plan described, expresses his entire confidence of being able to apply the same principle to a roof of any given span for which timber of sufficient length could be procured.

" This elegant improvement, which does away with all those inconvenient timbers in roofs of the ordinary construction, called king-posts, queen-posts, braces, &c. &c. consequently leaves the

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* In the middle of a building, where four principal and as many arch pieces meet, and consequently cannot cross each other as represented in the enclosed drawing, Mr. Holdsworth employs a sort of short king-post, which is suspended to the principal rafters by their being morticed into it; and the upper ends of the four arch pieces are let into mortices at the lower end of the post, where they all meet and are secured.

In a common hay-loft, or cottage, the same advantages may be obtained by letting the principal rafters rest on short pieces of wood; which may, as before described, be attached by a strap of iron to another piece going from the beams of the floor to the middle of the principal rafter immediately under the couple beam, where it may be secured. It may be of straight timber; but in the country, where there is always crooked timber enough about a farm of no use for house work, this will be employed to greater advantage, as it will save what is of more value to the carpenter, and at the same time will give more space in the room.

whole space (as before observed), which is usually employed to no useful purpose, for the making of good lofty rooms, besides effecting a considerable saving in timber.

"I am, Mr Editor,

"Your obedient Servant,

"*King-street, Westminster,* "WILLIAM ROOFUS."

"*July* 10, 1824.

APPLICATION OF MR. WILLOUGHBY'S PATENT IMPROVEMENTS TO THE CONSTRUCTION OF LIFE AND PILOT BOATS.

"London, July 12, 1824.

"SIR,

"YOUR periodical pamphlet, 'The Register of Arts and Sciences,' is evidently of such mental amusement, and extensive mechanical utility to all classes of society, that it is almost a remark of supererogation to say it ought to have a place in every library throughout the kingdom; whether this appertain to the noble and superb mansion, or to the humble cot.

"As even in the infancy of your edifying treatise, it has a very general circulation, we beg you will be pleased to insert the inclosed paragraphs; extracts from a MS. to be perhaps hereafter published, and dedicated (by particular permission) to his Royal Highness the Duke of Clarence, upon the patent nautical invention, which in Nos. 14 and 16, your pages elucidated so scientifically, and otherwise spoke of in such handsome terms.

"This request, as an imperious duty, we make solely on motives of pure philanthropy; in consequence of reading in the public prints, that within these few days past, two small boats on the river Thames, one at Leigh, near Southend, and the other at Gravesend, were unexpectedly upset by a sudden squall of wind, and six valuable lives lost to this world.

"Added to this, several direful accidents have lately occurred of a similar nature, by pleasure-boats upsetting, and hurling their inmates, unprepared, in the most disastrous manner, to a watery grave.* By inserting, and thereby giving publicity to these passages, they being of vast importance to a maritime nation, such as Great Britain, your valuable little work will not only be the vehicle, in this enlightened age, for affording, mechanically, greater velocity to small craft of every description, whether employed for useful purposes or amusement, but it will be the means of increasing this *amusement*, and for protecting their *often inexperienced* navigators against all danger; it being mathematically impossible for any boats thus skilfully equipped to sink, and almost impossible, with any management whatever, for them even to upset.

* Since the above was written, several other fatal accidents have occurred, the details of which have appeared in the news-papers. The above Communication is well deserving the consideration of our readers and the public at large. ED.

"As a further inducement for your complying with our request, we beg so state, for the information of the public, that these extracts were in particular highly commended by Admiral Sir Sidney Smith; to whom, as being one of our most distinguished naval officers, the original MS. was submitted for his approbation, personally, by the author.

"We are, Sir,

"Your obedient Servants,

"MECHANICAL PHILANTHROPISTS."

In allusion to some preceding statements our author says,—"Whichever of the fore-mentioned plans be adopted in fixing the ballast keel and leeboard to vessels of rather a large class with a view to prevent danger, for boats and small craft there is a second and more efficacious method of accomplishing so very desirable an object, and which, fortunately, will particularly answer for pilot boats. Whatever be the form of the hull, it is clear that independent of the cabin for the crew, there will remain a considerable vacant space in the hold by there being no longer any cargo or ballast; this can be filled up sufficiently, to guard against all accidents, with empty barrels, or cork shavings; this last article being so very cheap as to be purchased in any town for the trifling sum of six-pence per bushel. Thus, a pilot boat, by adopting my system, will be enabled to sail with twice the velocity, or at least half as fast again as they do now; by drawing up a small manageable artificial ballast keel, she may sail over bars, sand banks, and all other shallows; and finally, if she be even filled with water on the open sea, the empty barrels or cork will completely float her in an erect position, until she can be pumped thoroughly dry; consequently, each vessel making her appearance off a harbour will not only be more expeditiously and with more certainty served with a pilot; but in case of a storm and all other dangers, *she has a hundred life preservers ready to fly to her assistance,* for which reason alone every pilot boat round our coasts should be compelled at once to adopt the system. By each vessel of war in His Majesty's service being furnished with one or two of those life preservers, upon a small scale, it would effectually prevent those numerous disasters to which valuable officers and seamen fall victims in tempestuous and stormy weather, when unavoidably obliged to communicate in boats between one vessel and another, or from them to the shore, dangers so very imminent in some seaports, which by being surrounded with mountains, and from other local causes, are particularly liable to sudden gusts of wind, that during the late war general orders were actually issued in some few instances (such as at Gibraltar) to prevent ships of war's boats carrying any sail whatever. By our numerous pleasure boats, so frequently manned by young and inexperienced navigators being fitted out on the above plan, hundreds of valuable and respectable young men will be saved from a watery grave, in the prime of life, of which we are continually reading deplorable accounts in our daily papers, or which are at once buried in oblivion by the instances becoming too common to excite public attention."

THE ELEMENTS OF NATURAL PHILOSOPHY,

No. 15.—Optics.—Focal Distances.

(Continued from page 315.)

To find the focus of a plano-convex and a plano-concave lens:

By similar experiments to those which were described in our last number may be found, 1. That the focus of a plano-convex, or of a plano-concave glass, is equal to a diameter of its convex or concave surface, that is, of the whole sphere it belongs to.

2. That the focal distance of a double convex, or double concave glass, of equal convexities or concavities, is equal to a semi-diameter of either of its surfaces; and consequently that the focal distance of a glass of unequal convexities or concavities, will have an intermediate strength between a diameter and semi-diameter of that surface which is most convex or concave.

To measure the focal distance of a globe of water and of glass:

Take a hollow globe of glass, or instead of it, a thin round flask, or decanter, and making a round hole, about an inch in diameter, in a piece of brown paper, paste it on one side of the body of the decanter; and having filled it with water, hold the covered side to the sun, that the perpendicular rays may pass through the middle of the water and the emergent rays will be collected to a focus, whose nearest distance from the decanter will be equal to the semi-diameter of the body of it, as will appear by receiving the rays upon a paper held at that distance. That this effect is owing to the water and not to the glass, will be evident by emptying the decanter; for the light that then passes through the hole will be as broad as the hole itself at all the distances of the paper from the decanter.

If a similar experiment be tried with a solid globe, or ball of glass, the distance of the focus from the nearest part of the ball will be one quarter of its diameter.

To find the vertex, or centre of a lens:

Hold the lens at a proper distance from the eye, and observe the two reflected images of a candle made by the two surfaces. Move the lens till these images coincide, and that point is the vertex; and if this be in the middle of its surface the glass is truly centered, otherwise it is not.

Whatever be the shape and magnitude of the hole in the paper that covers part of a lens, the shape and magnitude of the image will be the same as when the lens is uncovered; because any small part of a pencil of rays has the same focus as the whole; but the brightness will be diminished in proportion as the hole in the cover is diminished; because the quantity of light which illuminates every point of a picture is diminished in that proportion.

In order to obtain a competent knowledge of refraction, and the properties of lenses, the student, who has not previously been made acquainted with mathematics, should make experiments with lenses of different foci, diameters, and colours; the room should be quite darkened, and the sun's rays admitted through an aperture cut in a

shutter, or a tube for that purpose placed therein, and moveable by an universal joint, or ball and socket. His lenses should be fitted in cells, connected to a sliding board or frame, or adapted to stands and frames of wood or brass. By such contrivances he may combine any sort of lenses together as may be necessary, either separately, or close together; he might also have lenses ground to the figure of a meniscus, or of a watch glass, and connected in one frame, so that fluids might be included and the properties of refraction by fluid lenses exemplified. A few experiments in this manner will afford the most evident and entertaining proofs of the laws of refracted rays. The dust usually in motion will in the darkened room give the various and natural figures of the converging and diverging pencil of rays.

To find the focal length of a spherical speculum :

1. For a concave speculum. Place the speculum so that its axis may be nearly towards the centre of the sun. Find the burning point, or receive the image upon a white piece of paper ; and the distance between the focus so found, and the vortex of the speculum, is the focal length. Or, cover the speculum with a sheet of opaque paper, in which make two or more holes, and observe where the beams of light, reflected from these holes unite, and this will be the focal distance. Or, lastly, place the speculum at the end of a long table, in a vertical position; place a candle at the opposite end of the table so that its flame may be opposite to the vertex of the speculum; then take a piece of white paper and having fixed it to a stick, place the stick in the socket of a candlestick so that the paper may be supported at about the same height with the candle; then move the paper or the candle forwards and backwards till the image of the candle on the paper is exactly over the candle itself, and the point of coincidence is the centre of the speculum.

2. For a convex speculum. Cover it with paper, having two pin-holes made, one near each edge of the mirror; expose it to the sun, holding another paper before it having a hole large enough to let the solar rays pass through to the two pin-holes. Two white spots of reflected light will be seen on each side the hole; move the paper backward and forward, till the distance of the spots be twice the distance of the holes in the cover; and that distance of the paper from the mirror is the principal focus.

[*To be continued.*]

MISCELLANEOUS INTELLIGENCE.

Pure Hydrogen Gas inodorous.—If the hydrogen gas, which has been obtained from a mixture of iron filings and diluted sulphuric acid, be made to pass through alcohol, the odour will in a great measure be lost : if water be added to the alcohol it acquires a milky appearance, and if it be enclosed in a flask, it deposits, after some days standing, a very odorous and volatile oil, which was previously contained in the gas, and caused its well known odour.—But a per-

fectly inodorous hydrogen gas may be obtained by putting an amalgam of potassiam and mercury into distilled water; and by the addition of an acid, or the muriate of ammonia to the water, the same odour is produced as in the solution of zinc by diluted sulphuric acid. It is therefore clear, that pure hydrogen gas is inodorous, and that the odour which usually accompanies the gas is owing to impurities.

Artificial Chalybeate Water.—Dr. Hare says, that if a few pieces of silver coin are placed alternately with pieces of sheet iron, and placing the pile so formed into water, the water soon acquires a chalybeate taste and yellowish hue, and in 24 hours, flocks of oxide of iron appear. Hence, by replenishing with water a vessel in which such a pile is placed, we may obtain, after each draught, a complete substitute for a chalybeate spring.

Tornadoes, Hurricanes, and Squalls accounted for by Dr. Hare of Philadelphia.—The air being a perfectly elastic fluid, its density is dependant on pressure, as well as on heat, and it does not follow that air which may be heated in consequence of its proximity to the earth, will give place to colder air from above. The pressure of the atmosphere varying with the elevation, one stratum of air may be as much rarer by the diminution of pressure consequent to its altitude as denser by the cold consequent to its remoteness from the earth, and another may be as much denser by the increased pressure arising from its proximity to the earth, as rarer by being warmer. Hence when unequally heated, different strata of the atmosphere do not always disturb each other. Yet after a time, the rarefaction in the lower stratum, by greater heat, may so far exceed that in the upper stratum, attendant on an inferior degree of pressure, that this stratum may preponderate, and begin to descend: whenever such a movement commences it must proceed with increased velocity; for the pressure on the upper stratum, and of course its density and weight, increase as it falls; whilst on the contrary, the density and weight of the lower stratum must lessen as it rises, and hence the change is, at times, so much accelerated as to occasion the furious, and suddenly varying currents of air which attend tornadoes, hurricanes, and squalls.—*Silliman's Journal.*

"The gilding of fluted and carved picture frames has been found to depend, in one of its most difficult operations, that of laying on the leaf-gold, upon electric action. After the frames are duly prepared, by a composition which is laid upon them with a brush, and the same has become dry, the surfaces intended to be gilt are brushed over with spirits of wine. The gold-leaf, in suitable-sized pieces, is then taken up on a flat camel-hair brush, and presented within half or three quarters of an inch of the part it is intended to cover, when instantly the gold-leaf flies off from the brush, and applies itself to every part of the moistened composition which it is capable from its size to cover, and covers the same, however irregular in shape, more perfectly than could otherwise be effected. The evaporating of the spirit excites the electric action which is the cause of this effect, which it is no less pleasant to witness than useful to obtain."—*Monthly Magazine.*

Hydrophobia.—A poor man, at Udine, the capital of Friuli, lying under the frightful tortures of Hydrophobia, was cured with some draughts of vinegar, given him by mistake instead of another potion. A physician of Padua, called Count Leonissa, got intelligence of this event at Udine, and tried the same remedy upon a patient that was brought to the Paduan hospital, administering him a pound of vinegar in the morning, another at noon, and a third at sunset; and the man was speedily and effectually cured.—*Weekly Register.*

The following discovery has been announced at Munich:—Lieutenant Hebenstreet has invented a process by which he makes a species of caterpillar spin a kind of wadding, which is of a fine white colour, and water-proof. He made a Balloon of this stuff, and raised it by means of a chafing dish with spirits of wine, in the large warehouse where he keeps his caterpillars at work. He makes them trace ciphers and figures in the wadding. He accomplishes this by moistening outlines of figures or letters with spirits of wine. The caterpillars avoid these tracings and spin their web around them. Thus any fine figure which has been drawn is represented in the stuff. A piece of wadding seven feet square perfectly pure, and as brilliant as taffeta, was made by about fifty caterpillars between the 5th and the 26th June. —*(Journal des Debats)*

Tallow-Tree.—A tree producing a substance like tallow, and which serves for the same purpose, grows very commonly in China. It is about the size of our cherry trees, with leaves of the shape of a heart, of a deep shining red colour, and its bark very smooth. The fruit it bears is in a kind of pod like a chesnut, and consists of three round white grains, each having its peculiar capsula, and within a little stone. This stone is encompassed by a white pulp, which has all the qualities of true tallow, both as to consistency, colour, and even smell; and accordingly the Chinese make their candles of it. All the preparation they give it, is to melt it down and mix a little oil with it, to make it softer and more pliant.

The Preservation of Meat, for very considerable periods of time, may, it has been discovered in France, be effected by the aid of soot, from the chimneys where wood only is burnt for fuel, as in a great part of France. One pound of this soot is sufficient to cure three pounds of beef, and, after which, the soot will be little, if any, the worse, as a manure for the farmer's crops. The soot is put into a vessel with about four times its weight of water, and allowed to macerate during 24 hours with frequent stirring. The clear liquor then decanted is found charged with an increase of about 1-25th of its weight, consisting of the pyroligneous acid and bituminous principles of the soot; and therein the meat, previously salted in the ordinary way, should be put to soak for half an hour, and then be taken out and dried in the open air: by which process its effectual preservation is effected, and, at the same time, no material taste communicated to the meat.—*Monthly Magazine.*

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

PREVENTING THE ILL EFFECTS OF FLIES ON SHEEP.—To the person who shall discover to the Society the most effectual method of protecting sheep from being disturbed and injured by flies.—The Silver Medal, or Ten Guineas.

COLOURLESS LAC VARNISH.—To the person who shall produce to the Society a varnish made from shell or seed lac, equally hard and as fit for use in the arts as that at present prepared from the above substances, but deprived of its colouring matter.—The Gold Medal, or Thirty Guineas.

SHAWLS OF CACHMERE WOOL.—To the person who shall invent and produce to the Society the best imitation of Indian shawls, made from real Cachmere wool, without any mixture of silk or other article.—The Gold Medal, or Thirty Guineas.

RECENT PATENTS.

To WILLIAM HOOTEN, of the Aqueduct Iron Works, Birmingham, for certain improvements in the manufacturing of wrought iron. Dated, June 15th, 1824.

To WILLIAM HARRINGTON, of Cork, for an improved raft for transporting of timber. Dated, June 15th, 1824.

To CHARLES CHUBB, of Portsea, Hampshire, ironmonger, for an improvement in the construction of locks. Dated, June 15, 1824.

To PHILIP TAYLOR, of the City Road, engineer; for certain improvements in apparatus for procuring gas from various substances. Dated, June 15th, 1824.

TO OUR READERS AND CORRESPONDENTS.

Most of our readers will probably have seen in the diurnal prints an account of the motion made in the Vice-Chancellor's Court, to which we in our last number referred; and although the publishers of this work obtained so triumphant a decision, we abstained from charging our columns with the details of the hearing, or of the indignation which his Honour displayed at the absurdity of the motion. As editors of a scientific work we thought it incompatible to evince any feelings of personality towards our very excellent cotemporary, and were desirous of leaving him to the amusing recreation of contemplating the bills of costs on both sides, *which he is to have the pleasure of discharging*. We are, however, compelled to recur to the subject in consequence of a direct attack upon us through our draughtsman, which appeared in a Sunday print, merely to direct our readers' attention to the liberality and candour which it evinces. A letter, signed '*Justitia!*' was inserted in last week's John Bull, charging the gentleman alluded to with no less a crime than that of having stated an evident falsehood; and impugning the judgment of the Vice-chancellor—a judgment formed without even hearing our counsel in defence. That such a charge should be made is the less astonishing when the result is considered, but from *whom* it should have emanated is *of course* a difficulty to us insurmountable, and we cannot but deplore the signs of the times when anonymous libellers gratuitously accuse other persons of the infamy which attaches to themselves, because knowledge is disseminated *at too cheap a rate, and official extortions evaded by honest, honorable, and reputable exertions.*

Mr. Frost's Letter was not received until our present number was sent to the press; the subject of it will meet with our earliest attention.

We assure Mechanicus that he is in error with regard to the power he conceives he will obtain by his machine; he has omitted to take into account the excessive friction that will be produced by the contact and rubbing of such extended surfaces.

The specification of the patent apparatus alluded to by W. M. is not yet enrolled; when that is done we will endeavour to give some account of it.

Y. Z. will perhaps have the goodness to call at our Publisher's relative to the subject of his note.

The subject of E. W's Letter in our next.

[*To be continued every* Fortnight.]

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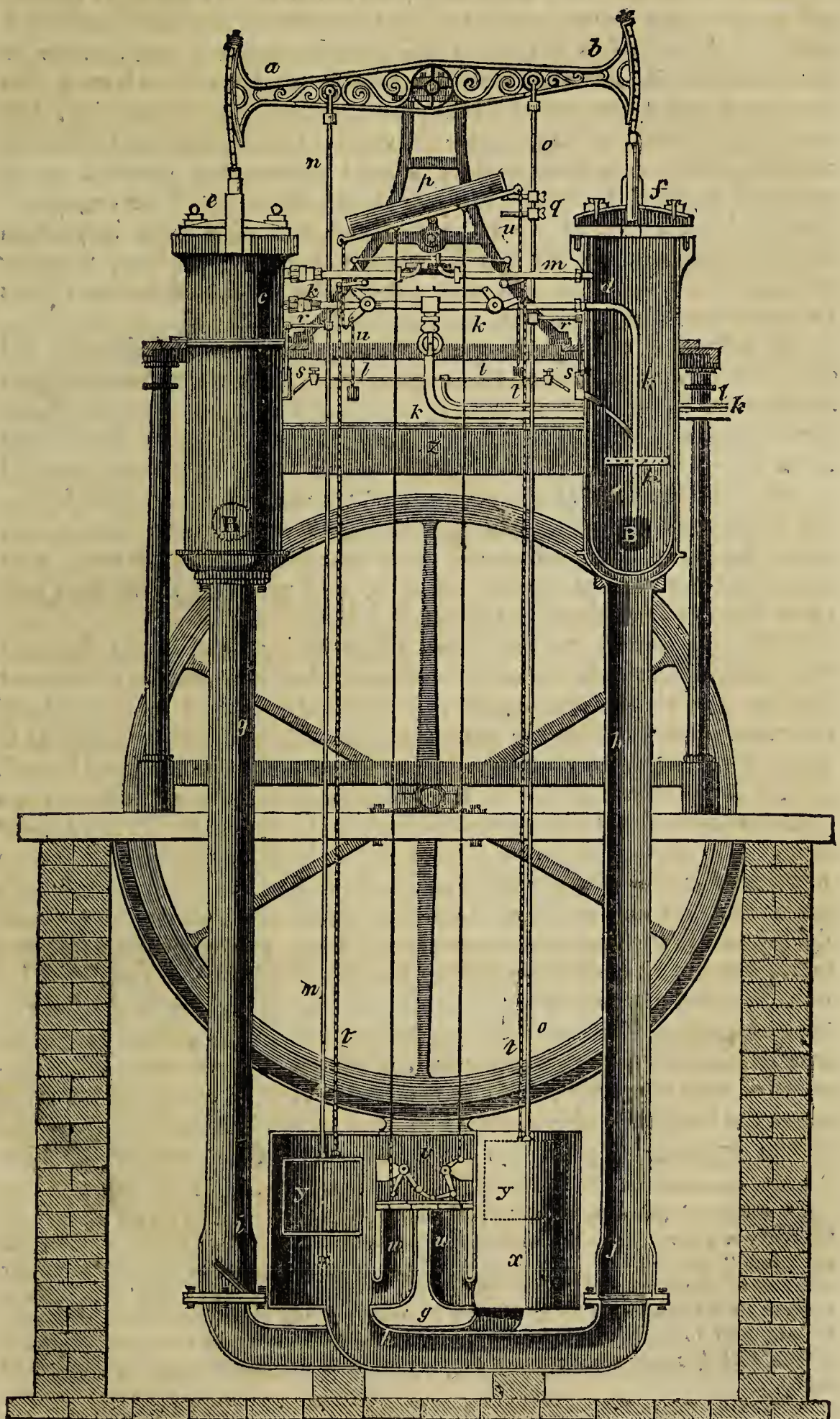

MR. BROWN'S PNEUMATIC, OR VACUUM ENGINE.

MR. SAMUEL BROWN'S VACUUM ENGINE.

We feel the deepest pleasure in presenting to our readers the account of this valuable discovery;—a discovery, which, in its use and application, promises fair to lead to results of the most important nature. Already has it elicited the greatest interest and anxiety in the public mind, not only from the reports of those by whom it has been seen and whose opinions may be considered as authorities, but from the rumours and speculations, vague, varied, and contradictory as they are, which have rapidly spread themselves through every possible channel by which the public attention could be engaged.* Having been favoured with the opportunities of a close inspection and examination, we are free to confess that our opinions, whether we consider it in its present state, or as the parent of nobler things to come, are warm, ardent, and decided.

In adverting to inventions of such magnitude we are naturally led on to the contemplation of those gigantic strides which natural philosophy has of late been making, and in the retrospect to which we are thus almost impelled, it is hard to check the thoughts that crowd upon us, or to repress those feelings under whose influence the mind travels over the land of science—a land teeming in unimagined fruits, for long ages barren and untrodden—but from whose ample and fertile bosom is now arising a mighty and magnificent harvest, rich in all that can reward the toil of man, and valuable in all that can raise him in the scale of the creation.

When we revert to the times of antiquity, and to the dormant state in which true science lay, we cannot but contrast its crude and dubious theories to the grand and brilliant practical discoveries of the present, not arising by graduated and successive steps, but, as it were, springing into existence by one great and extraordinary bound.

No longer buried in the trammels of perverting ignorance, no longer obscured by those clouds which once concealed it, no longer distorted to the foul purposes of an abominable superstition—the empire of science is now grandly and rapidly extending, and daily and hourly achieving that immensity of dominion which the philosophers of old darkly saw in the distance before them. Man, no longer lying idle and inert, but burning with the best and holiest ambition; intimidated by no difficulties present or prospective; unchecked by the magnitude of the enterprises which multiply themselves before him; impelled by an irresistible influence to the acquisition of new powers, and the attainment of new triumphs; bent to beat down, by the energy of his mind alone the barriers which oppose him, and secure in his own determined spirit; he sanguinely pursues the grand object of his cares, and, whilst

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* Some of these reports have been most extraordinary; and as there is scarcely a paper throughout the kingdom but has adverted to the subject, so each has "revised and corrected" the account according to its own peculiar notions of the matter. Ludicrous as all this is, we cannot but deprecate a system so fraught with evil. Whilst it merely tends to over-excite the expectation, and to feed that craving for the marvellous which is so prevalent, it cannot fail (to certain extents) to prejudice the object which it professes to serve.

the faculties of his mind develope new energies, hastens the progression of human knowledge, and increases the sum of individual happiness.

The fruits of science are not to be culled by individual toil, and it is in vain that he shall look for the full accomplishment of his designs, unassisted or unsupported by the labours of others. It is from the amalgamated strength of general zeal that a great good can be obtained. However great his capability, he is naturally and necessarily dependant upon his kind, and, without fellowship of labour, is nothing. No man can estimate the consequences, nor calculate the value of his labours; nor does he know whence he will derive his chiefest aid. From the actions and thoughts of other minds, he acquires fresh strength and reinforcement; and inasmuch as the collision and co-operation are greater, so will be his powers proportioned. He turns to the works of past ages, and from them he raises in the present, the structure which shall bear his name to future generations. He looks to the living, and strives with them in the great work in which they are engaged. Yet strongly and closely as he is linked in the bonds of intercourse, in *himself* exists the principle of accomplishment. From others, though he be compelled to collect his materials, yet by his individual agency alone are his efforts to be realised. Incited by example—impelled by honourable rivalry—or gathering past ideas into new combinations, it is to the cultivation of his innate faculties, to the original energy of his natural genius and industry that he must look for the completion of success. His own mind must be the laboratory wherein his accumulated powers must be wrought to profit; and, marshalling the aggregated implements of his strength, give being and existence to the new and mighty forms of his own conceptions.

The near relation which one branch of science bears to another, and the powerful influence which, however remote may be the apparent difference, each is formed to exercise over the others, have opened a new field to speculation in mechanical philosophy:—it is the calculation of this relation and influence which has, in so many recent instances, promoted its advancement, and brought it into practical and beneficial operation. One man discovers that the air we breathe is necessary to support ignition and combustion. Another revolving upon the observation gains, by the chemical process, a mechanical power of great and extraordinary magnitude, and by it lays the foundation for new experiments, new deducements, thoughts and theories, each and all connected with, and rising from their great original.

But we cannot allow ourselves to go fully into the consideration of a topic so great, nor to trace the consequences which arise from the cultivation of scientific knowledge; our high estimation of the merits of the Engine, which forms the subject of the foregoing observations, has induced us perhaps to prolong them too greatly.

The immense additions to the wealth and resources of this country, which have been produced by the invention of the steam-engine, are almost incalculable; and, at the recent meeting to promote the erection of a monument to the distinguished Watt,

received a testimony as gratifying to the lovers of science, as it was honourable to those who bore it. Without going at all in the comparative value of that noble power, and the subject of the present observations, it may be proper to observe, that, until the present moment, never has it been presumed that an engine was to be framed which could in any way compete with it. Now, although we believe that neither this nor any other machine can ever totally *supersede* the steam-engine, we without scruple give it as our opinion that it will prove a most powerful competitor: thus, then, has that great Instrument for the first time, a rival to contend with; and however startling this may appear, we do think that the principle of it is so good and so sound that the assertion will be fully borne out by the fact.

Although a comparison is thus to a certain extent set up, it must be considered that this new engine hast just sprung into existence, whilst the steam engine has been benefitted by the suggestions and improvements of almost every man of science since its first invention; it is not therefore to be supposed or expected that the one is calculated fully to compete with the other, upon the first moment of the discovery, when the other has been for so great a length of time, progressively advancing to a state of perfection. In alluding to both, as we here have done, we merely look at the principle of each, and when the description of the Vacuum Engine shall have been read, and duly examined, we do not hesitate in believing that a conviction of its practical utility will be manifest to the public.*

We shall now proceed to describe as explicitly as our limits will allow, its nature and operations.

The principle is simply this;—the formation of a vacuum in a cylinder by the combustion of hydrogen gas; and, that our readers may better comprehend the process by which this is done and the power thereby obtained, we will first of all quote the inventor's own words.

"Inflammable gas is introduced along a pipe into an open cylinder or vessel, whilst a flame placed on the outside of, but near to the cylinder is constantly kept burning, and at times comes in contact with and ignites the gas therein; the cylinder is then closed air-tight, and the flame is prevented from communicating with the gas in the cylinder. The gas continues to flow into the cylinder for a short space of time, then it is stopped off; during that time, it acts *by its combustion* upon the air within the cylinder and at the same time a part of the rarified air escapes through one or more valves,—and *thus a vacuum is effected*. The vessel, or cylinder, is kept cool by water. Several mechanical means may be contrived to bring the above combination into use in effecting the vacuum with inflammable gas, and on the same principle it may be done in one, two, or more cylinders or vessels." Having a vacuum effected by the above combination

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* Only one Journal has expressed any doubt as to the power of this Engine, but as it has not condescended to give any reasons in support of that doubt, we consider it unnecessary to enter into any argument on the subject.

and some mechanical contrivance, powers are produced by its application to machinery in several ways. First, water-wheels may be turned; secondly, water may be raised; and, thirdly, pistons may be worked.

Description of the Engine as used for turning a Water-wheel.

The two cylinders *c* and *d* are the vessels in which the vacuum is to be effected; from these descend the pipes *g i g* and *h j h* leading into the lower cylinders *x*, *x*, from which the water rises along those pipes to fill the vacuum cylinders alternately. The water thus supplied is discharged through the pipes B into the tank or trough *z*, whence it falls upon the overshot water-wheel, and by the rotatory motion thus produced gives power to such machinery as may be connected to it. The water runs from the wheel, along a case surrounding the lower half, into a reservoir *v*, from which the lower cylinders *x x* are alternately supplied.

In order to produce the vacuum, the necessary quantity of gas is supplied to the cylinders by means of the pipe *k k k* to be conveniently attached to a gasometer. The gas also passes along the small pipe *l l*, (communicating likewise with the gasometer), and being lighted at both ends of that pipe, is constantly burning for the purpose of igniting the gas within the cylinders.

The water in the reservoir *v* passing down one of the pipes *w* into one of the lower cylinders *x*, causes the float *y* in that cylinder to rise, and pushing up the rod *o* raises the end *b* of the beam, which of course draws up with it the cap *f*, and forces down the cap *e* of the other cylinder *c*.

The gas being admitted along the pipe *k*, the flame from the pipe *l* is now freely communicated to the gas in the cylinder through the orifice by the opening of the sliding valve *s*, which is raised by the arm *r* lifted by the rod *o* by means of the beam.

To produce the intermitting action of each cylinder, some subordinate machinery is put in operation by chains and rods attached to a glass or iron vessel *p*, partly filled with mercury, and, turning upon a pivot, each end receives its movements of elevation and depression from the rise and fall of the projecting arms *q* by the action of the beam above; the mercury being furnished for the purpose of regulating the supply of the gas into the cylinders, and the movement of the slide in the trough *v*. By the action thus communicated, the water from the reservoir flows down the pipe *w* into the vessel *x*, and produces the elevation of the float *y* and the rod *n*, and raises the cap *e* by the ascent of the beam at *a*.

The motion thus caused in this part of the machinery, operating upon its duplicate parts on the other side, of course produces by its action a corresponding movement; and the slider in the trough *v*, moved by the action of the mercurial tube *p*, being removed from its position, allows the water to fall into the other pipe *w*, and as it ascends suffers the float *y* to descend, and rising into the main cylinder, thus lifts again the beam at *b*, and its connections, and forces down the cap *e* on the top of the other cylinder.

After the vacuum is effected in the cylinders, the air must be ad-

mitted to allow the water to be discharged and the caps to be raised: this is accomplished by means of a sliding valve in the air pipe *m m*, acted upon by chains *t t*, attached to the floats in the reservoir, and as motion is given to them the valve is made to slide backwards and forwards, so as to allow of the free admission of atmospheric air.

Chains *u u* with suspended weights open the cocks in the pipe *h h*, and produce the alternate flow of the gas, and regulate and modify its supply.

In the pipes *g i g* and *h j h* are clacks to prevent the return of the water when the air is admitted into the cylinders.

When pistons are worked, the vacuum is effected (in the manner above described) under the piston, which is then pressed down by the weight of the atmosphere, and as an engine of that description is worked with two cylinders and pistons, the vacuum being produced in each cylinder alternately, the fall of one piston raises the other, and, being alternately pressed down, the piston rods give motion to the crank and fly-wheel. The air is admitted through large valves in the piston, and through orifices in the cylinders. An engine may be worked with one piston, the vacuum being produced in two cylinders (as in the water engine), from which a pipe communicates with a third cylinder in which the piston works, and into which the air is admitted alternately under and over the piston, while the vacuum extends to its opposite sides. By this contrivance a much greater rapidity of motion may be given to the piston if required.

"The ways being therefore explained, in which, by the pressure of the air, the vacuum produced (and continued) is applied to useful purposes, Mr. Brown claims to be the Inventor of the combination above described for effecting a vacuum, *however much* it may be *varied* by the *mechanical means* with which it may be used, and also the Inventor of applying a vacuum produced by the *combustion* of inflammable gas, to raising water, and to the production of motion in machinery by the pressure of the atmosphere."

We do not hear that any correct calculations have yet been made as to the exact expense of working the engines; but we understand that, as near as he can estimate from the quantity of gas consumed by the present engine, the patentee calculates on raising from 200 to 300 gallons of water fifteen feet high, with one cubic foot of coal gas. Should this be the fact, it is impossible that in many parts of the country the expense of working this Engine can approach that of keeping in motion a steam engine. In proof of this opinion we need only observe that the Gas Companies in London generally purchase their coals *under* 38*s*. per chaldron. The price of the coals they use is now from 30*s*. to 34*s*. by the cargo, and, as proprietors of engines would usually buy in large quantities, and seldom purchase at high (winter) prices, we may conclude that the average rate would not exceed 40*s*.—so far, however, the advantages are equal in steam-engines; but it is a well-known fact, that the gas companies here are now *(in summer)* selling their coke at from 21*s*. to 23*s*, per chaldron, and meet with a ready sale at those prices; as therefore

one chaldron of coal will make about 1½ chaldron of coke, besides 20 gallons of tar, &c, we leave our readers to calculate the small cost of 13,000 to 14,000 cubic feet of gas, the produce of one chaldron of coals: thus, it is clear, that in London, and in those parts of the country where an extensive population creates a ready sale for the coke, the saving in the use of these engines will be *extremely great.* This reasoning, however, is partly founded on the conclusion, that the labour required to generate the gas, and attend to the engine, will not exceed that requisite to keep up the fire, and conduct the operation of a steam-engine.

It will be seen that the nuisance arising from the immense volumes of smoke by which the public buildings in London are so much defaced, and, at times, the atmosphere is so much darkened, will, by the employment of this engine, be entirely averted.

There is another advantage, too, attending the use of this engine, which will weigh considerably in its adoption: viz. the possibility of establishing manufactories in places remote from the present manufacturing districts; in parts of the country where labour is very cheap, and particularly in the neighbourhood of an abundance of peat, from which vegetable excellent gas may be made—this latter observation will also apply to the use of an engine for draining fens and mines, near which peat generally abounds; in fact, new ideas and speculations will soon follow the promulgation of this singular and simple invention.

The advantages to be derived from this engine, as detailed in the descriptive outline of the inventor, are,

1st. "The quantity of gas consumed being very small, the expense of working the engine is moderate.—In its application on land the saving will be extremely great, the cost of the coal gas (deducting the value of the coke) being inconsiderable. The expense of working a marine engine will certainly be greater, as the gas used for that purpose must be extracted from oil, pitch, tar, or some other substance equally portable, yet even in this case, it will not equal the cost of the fuel required to propel a steam-boat; and, as a few buts of oil will be sufficient for a long voyage, vessels of the largest tonnage may be propelled to the most distant parts of the world.

2d. "The engine is light and portable in its construction, the average weight being less than *one fifth* the weight of a *steam*-engine *(and boiler)* of the same power; it also occupies a much smaller space, and does not require the erection of so strong a building, nor of a lofty chimney. In vessels, the saving of tonnage will be highly advantageous, both in the smaller comparative weight and size of the engine, and in the very reduced space required for fuel.

3d. "This engine is entirely free from danger. *No boiler being used,* explosion cannot take place, and as the quantity of gas consumed is so small, and the only pressure that of the atmosphere, it is impossible that the cylinder can burst, or the accidents incidental to steam-boats occur.

"The power of the engine (being derived from the atmospheric pressure of ten pounds and upwards to the square inch) may be

increased, with the dimensions of the cylinders, to any extent, and always ascertained by the application of a mercurial gauge.

"It is scarcely necessary to allude to the well known fact, that, after deducting the friction arising from the use of the air and cold water pumps, &c. &c., the general *available* power of the condensing *steam*-engine is from seven to eight pounds per square inch.

"The cost of the machine will be moderate, *particularly as constructed for raising water;* it is therefore peculiarly adapted for draining fens, &c. or supplying reservoirs. The expense of wear and tear will also be considerably less than that of the steam-engine, and, when occasionally out of order, it may be repaired at a trifling cost, and with but little delay."

The want of time has prevented us from looking so minutely into various subjects which bear on this as we could wish, but one for our future consideration, for the information of those interested in the application of this engine to vessels, will be the possibility of generating hydrogen gas from fresh or salt water, with a small furnace, which might be safely constructed, or by chemical aid if possible; and as this opens a new and interesting field for study, we shall feel thankful for any communication on the subject from some of our numerous scientific readers. A great advantage would doubtless be gained from the use of pure hydrogen in the superiority of the vacuum effected with it, and in the total absence of corrosion, &c. The mercury is raised by the vacuum effected with coal gas, we believe, from 22 to 24 inches.

In the drawing up of this account we have been greatly distressed for time, and, there is no question, some inaccuracies may have arisen: we trust, however, that the exertions we have made to get the account for the present Number, will be so far appreciated as to go somewhat to extenuate the trifling errors which may be discoverable; but it is more than probable that we shall have occasion again to advert to the subject in our next.

In conclusion, we cannot but call public attention to a circumstance of vital importance to all patentees. By the unremitting endeavours of the present patentee and his coadjutors, we understand that they have secured to themselves a patent in *America*, which never before was granted to other than citizens, or those intending to become citizens. In establishing a precedent so important to future patentees, we think that too much praise cannot be given to them.

"*Walworth, 29th June,* 1824.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"WOULD not a description of the method pursued in preparing the foundation for and erecting of the New London Bridge, be a proper subject for *the Register of the Arts and Sciences?*

if so, doubtless such information could be procured from time to time from some one competent to afford it; the insertion of a paragraph, requesting it in your interesting work, would, I should think, be speedily answered.

"I am, Sir, Your's, respectfully,
"E. E."

(The Keel, under water, not seen in the above cut).

A PATENT BALLAST-KEELED LUGGER, UNDER A HEAVY PRESS OF SAIL.

We with pleasure insert the following letter that we have received, which confirms our opinion of the national advantages that may be derived by the adoption of Mr. Willoughby's Patent Nautical Improvements, already announced and elucidated in numbers 14, 16, 21; and as it affords us the opportunity of presenting our readers with an engraving of a Sailing Packet, constructed with the ballast-keel, under a heavy press of sail in a brisk gale of wind, and supposed to be sailing at the rate of sixteen or eighteen knots per hour. This extraordinary velocity is obtained by the vast extent of canvas, which a vessel so constructed has the ability to sustain, owing to the powerful counterpoise, or *leverage*, of the ballast-keel.

We have by us the sketch of a three-masted schooner, constructed also with the ballast-keel, and intended to be fitted out with Engines, which we purpose giving an engraving of in an early subsequent number. This improvement is of such importance in

making distant voyages, by combining the advantages of the certainty of an expeditious passage, with comfort and safety, as to cause from the moment of their being carried into effect, a new epoch in the art of navigation; creditable to Great Britain, as a maritime nation, for having given them birth, and beneficial to the world at large, by facilitating a speedy communication with the remotest nations of the globe, however great the expanse of ocean that may lie between them.

IMPROVED STEAM AND SAILING PACKETS.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"HAVING been brought up in my youthful days to a seafaring life, and being in my retirement a constant reader of your entertaining Magazine, it is with much satisfaction (as it reminds me of old times), that I attentively peruse those tracts treating of navigation; and should the following observations, respecting Mr. Willoughby's nautical improvements be deemed worthy of the notice of the public, you have my free permission to make use of them.

"I have no hesitation in asserting that the shifting ballast keel applied to steam vessels would give them a decided superiority over all others; inasmuch as they would then be enabled to avail themselves of the use of canvas, without burying their lee-wheels in water, and thus unite the power of the engine, with that possessed by ships of the old build; their progress thereby would be consequently greatly accelerated, and whenever the wind was sufficiently powerful, the engine might be stopped, and the consumption of coal for the time saved.

"If vessels be built also according to the plan laid down in his treatise, viz. with a completely flat bottom, the stern nearly flat and forming an acute angle with the sea, and owing to her extreme light draught of water, she would literally rather skim over its surface, than plough heavily through it as practised at present; her keel when lowered down would give all the requisite stiffness; her flat suspender enable the vessel to hold her wind, and she would consequently (unless when the wind fails) perform a voyage in half the usual time across the Atlantic or elsewhere, without even the aid of our recently powerful ally steam.

"My sea voyages having been principally confined to the Baltic, I can confidently advance, that his invention is admirably adapted to those seas, as almost every part is considerably impeded by sand bars; over which vessels constructed with sliding ballast keels, by simply drawing them up, might pass, and ascend or descend shallow navigable rivers with ease and safety; this being of the greatest advantage to those northern latitudes, where the days in winter months are extremely short, the seas partially stopped up with ice, and the coasts, particularly when on a lee-shore, eminently dangerous.

"Some months ago, a printed prospectus (now in my possession) was presented to me for steam packets constructed upon Mr. Wil-

loughby's nautical principles to navigate between London and St. Petersburg; the voyage out and home (going and returning through the canal of Kiel) was calculated for both passages not to exceed fourteen days; why this project was not carried into execution I know not; it anyhow met with my hearty approbation; by its adoption hundreds if not thousands of our enterprising merchants, and travelling gentry would hereafter each season be embarking for Russia, Prussia, Sweden, Denmark, and other eastern countries; who, at present for want of a comfortable, safe, and expeditious conveyance to these territories, confine their excursions chiefly to France and the Netherlands; on the other hand, hundreds if not thousands of individuals from those nations would be annually flocking to England on business, curiosity, or amusement, and thereby communicate mutual benefit and pleasure; in short, whether the subject be viewed in a private or public light, this nautical invention ought to receive every encouragement and assistance from the liberal and unprejudiced which it merits; even if alone among other benefits for the rapid and safe conveyance of mails and passengers from one country to another; not only to unite and strengthen the bonds of intercourse between Great Britain and the various nations of the Baltic, but between Great Britain and all parts of the known globe.

"I remain Sir,

"Your most obedient servant,

"AMICUS NAUTÆ."

ON THE IMPORTANT USES OF THE FARINA OF POTATOES.

(Concluded from page 325, last Number.)

In the manufacture of sea-bread or biscuit, the introduction of a portion of the Farina materially improves the quality, and enables them to be kept good for a much longer period of time. In the state of flour it is peculiarly important as a sea store, on account of its imperishable nature, and in its general usefulness. It is an excellent substitute for rice, peas, or oatmeal, and will go much farther than any of them in thickening the soup.

In most parts of France it is extensively used as food in a great variety of forms. The economical people of that country being fully aware of its value, large manufactories are established in many places for the purpose of separating the Farina from the root for sale. But such is our relish for foreign productions in preference to those of our own country, that I doubt not if the potatoe-flour were to be brought from South-Sea Islands, it would be highly extolled, and supply the present starch so much in fashion called arrow-root, which we go to the East and West Indies to obtain. It is indeed lamentable to think how many poor mothers go to the druggist or the grocer and give as much money for an ounce of arrow-root as they might obtain a pound of potatoe flour for, if manufactories were established for producing it in this country, as is done in France. The properties

of potatoe flour and arrow-root flour are precisely alike, they are both pure starch, and obtained by a similar process, from two bulbous rooted plants. An equal quantity of each mixed and dissolved separately in equal proportions of water, make jelly-like mucilages of the same consistence, not to be known from one another but by a slight difference in the taste. The sago and salep of the East, the tapioca and semolina of the West, the cassava and couac of the South, and the potatoe farina of the North, are only so many different forms given to the same vegetable principle, namely, *starch*.

When potatoe starch is exposed to a temperature of between 600° and 700° it swells, exhales a peculiar smell, and becomes of a brown colour ; in this state it is extensively used by the calico printers, is soluble in cold water, and known in commerce by the term *British Gum*.

The starch or farina is easily convertible into sugar by digestion in dilute sulphuric acid. Large quantities of it is employed in various parts of Europe in the manufacture of Brandy. That eminent chemist, Berzelius, has recommended it for that purpose to the Swedish government, and M. D'Oersted to that of Denmark; and it is said that the Brandy made from it is scarcely inferior to the French.

Should the foregoing observations be deemed worthy of a place in your interesting miscellany, I shall be happy to continue them at some future period.

I am, Sir, your obedient Servant,

H. L.

WHITE'S FLOATING BREAKWATER.

As the advantages of this Breakwater have already been proved at Deal and other places, we feel it incumbent upon us not to defer giving some account of its construction, however brief. It consists of a series of square frames of large timber connected together by chain cables, and secured in their situation by anchors or blocks. The shape or form of the harbour determines the relative position of the several frames composing the series, which may be of any figure, and be altered, enlarged, or contracted at pleasure with great facility: within the space thus enclosed, ships may ride in safety, defended from the surf of the foaming element.

The frames are constructed with logs of Quebec yellow pine, of from 30 to 50 feet in length, and from 18 to 20 inches in thickness, which are bolted together so as to form a square frame, consisting of two parallel frames. The height of the frames above the water varies according to the situation of the harbour; if exposed to a very heavy surf, as many as five tiers of frames placed vertically one upon the other, are found requisite to obtain smooth water within the harbour. The invention is applicable on the smallest scale, where a Breakwater is desirable, and will no doubt be found highly useful in protecting fishing boats, bathing places, &c.

" *To the Editor of the Register of the Arts and Sciences, &c.*
" SIR,

" IN the month of April last I sent to the Editor of the Monthly Magazine, the description of a method, whereby a letter could be conveyed at the rate of 100 miles in an hour, and it was inserted in the Magazine which was published on the 1st of July. I had ascertained the possibility of the matter by an experiment I made more than ten years ago, with machinery constructed for the purpose, which I now have by me. I shewed the experiment to a friend at that time, and communicated it to others. On examining a few days ago No. 18 of your Register, I met with the statement of a method of conveyance similar to my own, said to be the invention of Mr. Vallance, and have no doubt of it being his invention, for I cannot suppose my experiment to have been communicated to him; it appears that we have both thought of the same means of producing extraordinary velocity. The method I think will certainly answer for the conveyance of letters, but doubt the possibility of it being carried to the extent which Mr. Vallance supposes.

" I am, Sir,

" *Inner Temple,* " Your very humble Servant,
" 3*rd August,* 1824. " EDWARD STEERS."

" *To the Editor of the Register of the Arts and Sciences, &c.*
" SIR,

" ATTRACTED by a notice in your last Register of a preparation of artificial chalybeate water, allow me to lay before your readers another, and, in my opinion, superior extemporaneous form of the same liquid. We all know that the properties of chalybeate springs depend on the quantity of sulphate of iron they contain, so, therefore, would it not be preferable to dissolve a portion of that substance in water, by which means we can manufacture the same article with but little expense or trouble. If I were asked what proportion I would add of the sulphate of iron, it would be thus :

" Take of sulphate of iron (green copperas) one drachm; diluted sulphuric acid (vitriol) half an ounce; water one gallon.

" The acid increases the tonic powers of the water, and renders the liquid quite transparent and colourless, which, if omitted, would have a yellow tinge, and copious precipitate of oxide of iron. It is proper to add that the bottle in which this composition is made should be of stone, and be well corked to prevent the action of the atmosphere on the iron, the oxygen of which would soon convert it into an insoluble oxide.

" For medical purposes,—if two ounces of sulphate of soda (Glauber's salt), or the same quantity of sulphate of magnesia (Epsom salt), were added, and a tumbler-full taken every morning, the advantages of most of our chalybeate springs would be attained at a very cheap rate.

" *July* 26*th* 1824. " Yours, &c. " A. P."

IVORY PAPER.

The properties which render ivory so desirable a subject for the miniature painter, and other artists are, the evenness and fineness of its grain, its allowing all water colours laid on its surface to be washed out with a soft wet brush, and the facility with which the artist may scrape off the colour from any particular part, by means of the point of a knife or other convenient instrument, and thus heighten and add brilliancy to the lights in his painting more expeditiously and efficaciously than can be done in any other way.

The objections to ivory are, its high price, the impossibility of obtaining plates exceeding very moderate dimensions; and the coarseness of grain in the larger of these; its liability, when thin, to warp by changes of the weather, and its property of turning yellow by long exposure to the light, owing to the oil which it contains.

Traces made on the surface of this paper by a hard black lead pencil are much easier effaced by Indian rubber than from common drawing paper, which circumstance, together with the extremely fine lines which its hard and even surface is capable of receiving, peculiarly adapts it for the reception of the most delicate kind of pencil-drawings and outlines. The colours laid upon it have a greater brilliancy than when laid upon ivory, owing to the superior whiteness of the ground. Colours on ivory are apt to be injured by the transudation of the animal oil, a defect which the Ivory Paper is free from. The following is the process given by Mr. Einslie (of Stratton Ground, Westminster) to the Society of Arts, for which he was voted the sum of Thirty Guineas.

"Take a quarter of a pound of clean parchment cuttings, and put them into a two-quart pan, with nearly as much water as it will hold; boil the mixture gently for four or five hours, adding water from time to time, to supply the place of that driven off by evaporation; then carefully strain the liquor from the dregs through a cloth, and when cold it will form a strong jelly, which may be called size (No. 1.)

"Return the dregs of the preceding process into the pan, fill it with water, and again boil it as before for four or five hours; then strain off the liquor, and call it size (No. 2.)

"Take three sheets of drawing paper (outsides will answer the purpose perfectly well, and being much cheaper are therefore to be preferred,) wet them on both sides with a soft sponge dipped in water, and paste them together with the size (No. 2.) While they are still wet, lay them on a table, and place them upon a smooth slab of writing slate, of a size somewhat smaller than the paper. Turn up the edges of the paper, and paste them on the back of the slate, and then allow the paper to dry gradually. Wet, as before, three more sheets of the same kind of paper, and paste them on the others, one at a time; cut off with a knife what projects beyond the edges of the slate, and when the whole has become perfectly dry, wrap a small piece of slate in coarse sand-paper, and with this rubber make the surface of the paper quite even and smooth. Then paste on an inside sheet, which must be quite free from spots or dirt of any kind;

cut off the projecting edges as before, and when dry, rub it with fine glass-paper, which will produce a perfectly smooth surface. Now take half a pint of the size (No. 1.) melt it by a gentle heat, and then stir into it three table-spoons full of fine plaster of Paris; when the mixture is completed, pour it out on the paper, and with a soft wet sponge distribute it as evenly as possible over the surface. Then allow the surface to dry slowly, and rub it again with fine glass-paper. Lastly, take a few spoons full of the size (No. 1.), and mix it with three-fourths its quantity of water; unite the two by a gentle heat, and when the mass has cooled, so as to be in a semi-gelatinous state, pour about one third of it on the surface of the paper, and spread it evenly with the sponge; when this has dried, pour on another portion, and afterwards the remainder; when the whole has again become dry, rub it over lightly with fine glass-paper, and the process is completed; it may, accordingly, be cut away from the slab of slate, and is ready for use."

The quantity of ingredients above-mentioned is sufficient for a piece of paper 17½ by 15½ inches.

Plaster of Paris gives a perfectly white surface; oxide of zinc, mixed with plaster of Paris, in the proportion of four parts of the former to three of the latter, gives a tint very nearly resembling ivory; precipitated carbonate of barytes gives a tint intermediate between the two. (*Abridged from the Transactions of the Society of Arts.*)

NATURAL HISTORY.

M. Cuvier has lately presented to the French Academy of Sciences, a Report on the state of Natural History, and the vast increase of our knowledge in that department, since the return of maritime peace, the details of which are highly interesting.

Plants.—In 1778 Linnæus described about 8000 species of plants; M. Dreandolle, has now increased the list to 40,000.

Quadrupeds.—The number of quadrupeds was estimated by Buffon at about 300; already has M. Desmarets enumerated more than 700.

Fish.—M. de Lacipede who about 20 years ago wrote the History of all the known species of fish, made them less than 1500 in number, now the Cabinet of the King alone contains more than 2500, and they are considered but as a small portion of what will yet be furnished.

Birds and Reptiles.—Are numberless; the cabinets are crowded with new species, which are not yet classed.

Insects.—Are brought from various climates by thousands; the Cabinets of the King alone contains already more than 25,000 species.

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

ENGRAVING ON BLOCKS.—For the best engraving on wood blocks, of an historical subject, the size of the principal figure not less than six inches in height, and the block to be at least twelve inches by nine.—The Gold Isis Medal.

CURE OF THE ROT IN SHEEP.—To the person who shall discover to the Society the best and most effectual method of curing the rot in sheep, verified by repeated and satisfactory experiments.—The Gold Medal, or Fifty Guineas.

IMPROVED EARTHENWARE CRUCIBLES.—To the person who shall invent and discover to the Society a process for manufacturing earthenware crucibles, which shall be capable of enduring higher degrees of heat than those now in use, and shall not be too expensive.—The Gold Medal, or Thirty Guineas.

PREMIUM FOR MEDICAL OR SURGICAL STUDENTS.—For the best original drawing (made from actual dissection) of the anatomy of the human body, or of any part thereof, sufficiently free and accurate for the purposes of surgery: such drawing to be not less than the natural size of the parts; by persons under the age of twenty-two.—The Silver Medal.

RECENT PATENTS.

To WILLIAM BAILEY, the younger, of Lane-end, Staffordshire Potteries; for an improved gas-consumer, for the more effectual consuming the smoke arising from gas burners or lamps. Dated, June 16th, 1824.

To JOHN HEATHCOTT, of Tiverton, Devon; for certain improvements in the methods of preparing and manufacturing silk for weaving and other purposes. Dated June 15th, 1824.

HUMPHREY AUSTIN, of Alderley Mills, Gloucestershire, manufacturer, for certain improvements on shearing machines, Dated, June 22, 1824.

WILLIAM PONTIFEX, of Shoe Lane, coppersmith and engineer, for improved modes of adjusting or equalising the pressure of fluids or liquids in pipes or tubes, and also an improved mode of measuring the said fluids or liquids. Dated, July 3, 1824.

JOHN LEIGH BRADBURY, of Manchester, for a method of twisting, spinning, or throwing silk, cotton, wool, linen, or other threads, or fibrous substances. Dated, July 3, 1824.

PHILIP TAYLOR, of the City-road, engineer, for certain improvements on steam-engines. Dated, July 3, 1824.

TO OUR READERS AND CORRESPONDENTS.

Mr. Frost's Letter relative to the account of the improved Lock Cock, given in our 20th number, we have duly attended to. The specification of his patent, to which he refers us, we have carefully read, and find it to be a description of a totally different contrivance; it contains no mention whatever of "the double and treble thread, the screwed socket key, and spiral spring," as claimed by him; the invention of these things is indeed of much older date than his patent. It is therefore in the application of them only in which an invention can consist, and the manner in which these were applied (in our recent description of Mr. Russell's Improvement) appears to us to be quite original. For these reasons, as well as a desire to prevent the introduction of controversial correspondence on points upon which our readers can feel little or no interest, we are under the necessity of declining the insertion of Mr. Frost's Letter.

Mr. Combes's complaint will be inquired into.

Secker will perhaps favor our publisher with the sight of a specimen of the kind of printing he alludes to. We will give an early insertion to his several queries.

Our other Correspondents must stand over till next week.

[*To be continued every* Fortnight.]

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REGISTER

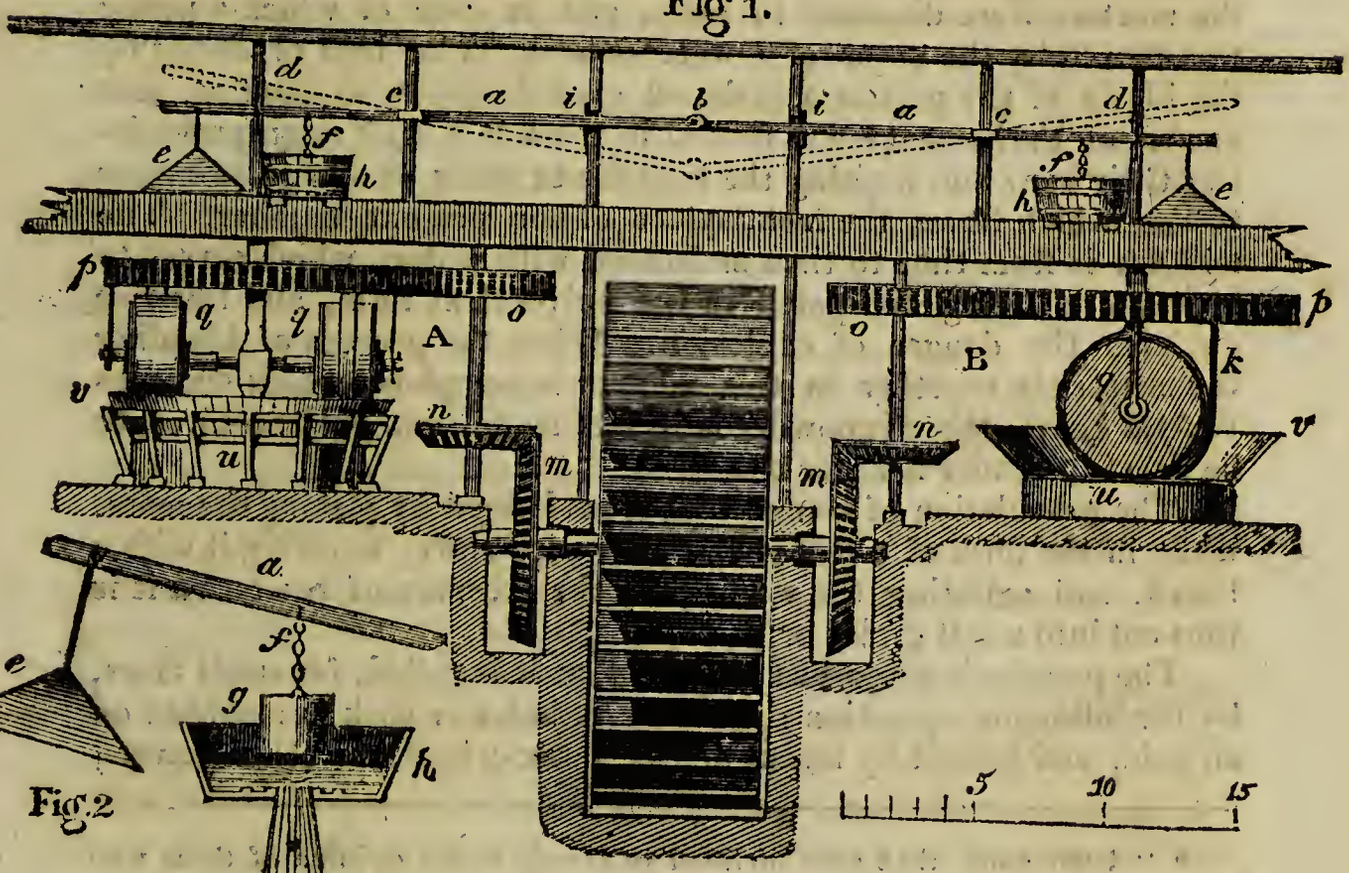
OF

THE ARTS AND SCIENCES.

IMPROVEMENTS & DISCOVERIES.

No. 23]. SATURDAY, AUGUST 21, 1824. [Price 3*d*.

Fig 1.



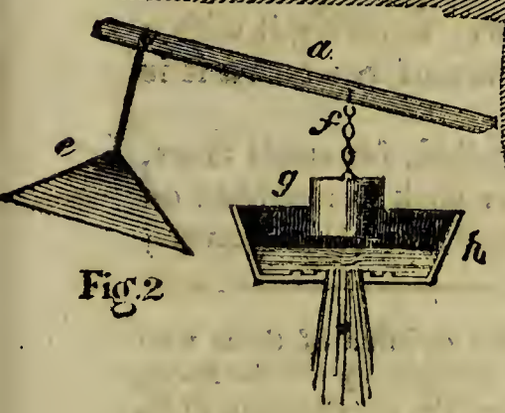


Fig 2

MR. MONK'S IMPROVED GUNPOWDER MILL,

For lessening the destructive effects of Explosion.

The origin of the invention of Gunpowder is a question upon which the learned are yet undecided. It has very generally been ascribed to one Schwartz, a German monk, in 1320; who having by chance mixed together in a mortar, the ingredients which constitute this explosive compound, and having covered it with a stone, it accidently took fire, and blew up the stone. The name, mortars, given to the most ancient species of artillery with which we are acquainted, strongly favors this account of the discovery; but it appears that Roger Bacon knew of Gunpowder, and recommended its use in warfare, nearly one hundred years before that period. There is however, but little doubt, that the antiquity of the invention is much greater, as allusions are frequently made in the writings of the ancient Greeks and Romans to a compound of a similar nature. In the year 1798, M. Langles proved in a paper read in the French National Institute, that the Arabians obtained a knowledge of Gunpowder from the Indians, who had been acquainted with it at the

earliest periods. The use of it in war was forbidden in their sacred books, the Vedam or Vede. It was employed in 690 at the battle near Mecca.* Some writers state that it has been known to the Chinese and Indians for thousands of years.

The most approved proportions for the composition of Gunpowder are 75 parts by weight of nitre, to 16 of charcoal, and 9 of sulphur, which, being separately reduced to a fine powder, are intimately blended together with a small quantity of water. This operation was formerly performed by pounding in wooden mortars with wooden pestles; in the large way, by means of a mill, wherein the mortars were disposed in rows, and in each of which a pestle was moved by the arbor of a water-wheel. The heat produced by the blows of the pestles occasioned such frequent explosions, that an Act of Parliament† was passed in the late King's reign prohibiting their use, and limiting the licences to Mills similar in principle to that which forms the frontispiece of our present number. The mixture is from time to time moistened with water, which serves to prevent its being dissipated in the pulverulent form, and likewise obviates the danger of explosion. When the process of blending the materials together in this manner is complete, which occupies several hours, the gunpowder is in fact made, and only requires to be dried to render it fit for use.

The granulation of Gunpowder is performed by placing the mass, while in the form of a stiff paste, in a wire-sieve, covering it with a board, and agitating the whole; by the pressure of the board it is thus cut into small grains or parts.

The powder is smoothed or glazed, as it is called, for small arms, by the following operation: a hollow cylinder or cask is mounted on an axis, and turned by means of the water-wheel, or other power;

---

* "I am more than ever inclined to accede to the opinion of those who believe that Gunpowder was invented in India, and brought by the Saracens from Africa to the Europeans; who however improved the preparation of it, and found out different ways of employing it in war, as well as arms and cannon."—*Beckmann.*

† By the Statute 12th Geo. III. c. 61. No person shall make gunpowder, but in the regular manufactories established at the time of making the statute, or licensed by the Sessions, pursuant to certain provisions, under forfeiture of the gunpowder and two shillings per pound; nor are pestle mills to be used under a similar penalty. Only forty pounds of powder is to be made at one time under one pair of stones, except Battle-powder made at Battle and elsewhere in Sussex. Not more than forty hundred weight to be dried at one time in one stove; and the quantity only required for immediate use to be kept in or near the place of making, except in brick or stone magazines fifty yards at least from the mill. Not more than 25 barrels to be carried in any land carriage, nor more than 200 barrels by water, unless going by sea or coastwise, and each barrel not to contain more than 100 pounds. No dealer to keep more than 200lbs. of powder, nor any person, not a dealer, more than fifty pounds in the cities of London and Westminster, or within three miles thereof, or within any other city, borough, or market-town, or one mile thereof, or within two miles of the king's palaces, or magazines, or half a mile of any parish-church, on pain of forfeiture, and two shillings per pound, except in licenced mills, or to the amount of three hundred pounds for the use of collieries, within two hundred yards of them.

this cask is half-filled with powder, and turned for six hours, and thus by the mutual friction of the grains of powder it is smoothed or glazed. The fine mealy part thus seperated or worn off from the rest, is again granulated. The granulation causes it to take fire more readily, as the inflammation is more speedily propagated through the interstices of the grains.

The variations of strength in different samples of gunpowder, are generally owing to the more or less minute division and intimate mixture of the parts:—the reason of this may be easily deduced from the consideration, that nitre does not detonate until in contact with inflammable matter, consequently the whole detonation will be the more speedy, the more numerous the surfaces of contact. For this reason also, the ingredients should be very pure, as the mixture of any foreign matter not only diminishes the quantity of effective ingredients but prevents their contact by its interposition.

The elastic product obtained by the detonation of gunpowder, was found by Berthollet to consist of two parts nitrogen gas, and one carbonic acid gas. The sudden extrication and expansion of these gases are the cause of the effects of gunpowder.

The Mill which we have now to describe was invented by Mr. James Monk, the manager at the Gunpowder-mills of Messrs. Burton, Children and Burton, near Tunbridge, about six years ago; a model and description of which was presented to the Society of Arts in 1819, who very properly voted Mr. Monk their silver medal, and twenty guineas for the same, as a mark of their sense of its merits.

a a, fig. 1. is a compound lever formed of two iron bars, the extremities of which terminate above the bedstones of the pair of mills A B; these levers are connected at their other extremities by a bolt at *b*, forming a joint, and permitting the levers to move so as to form a very obtuse angle, when a power from below upwards is applied to either of the ends of the levers *a a*, as shewn by the dotted lines.

c c, are two oblong holes in the lever bars, through which two screws are put, which being screwed into the two uprights, constitute the two fixed fulcrums of the lever.

d d, are two uprights, with an eye or loop in each to receive and steady the ends of the lever, which are made long enough to allow the bars to take the position indicated by the dotted lines.

e e, are two blowers, made of thin sheet iron, in the form of hollow three-sided pyramids, and are suspended by two iron rods to the ends of the levers *a a*. These blowers are placed as near as possible to the tops of the upright stone shafts, and as close to the wheels as the timber will allow.

f f, are two copper chains, attached by one end to the lever bars, and by the other supporting two copper-valves which are not seen in fig. 1, being inside the tubs, but one of them is shewn at *g*, in the section of a tub, fig. 2.

h h, are two oval tubs, capable of holding about six gallons of water, having a circular hole at the bottom. Surrounding this hole

is a grooved block having a channel all round it, into which the bottom edges of the cylindrical valves fit, shewn in section at fig. 2.

i i, are two small spring catches fastened to the two uprights. The lever bars are laid on the top of these catches, so that when the ends of the lever rise, that part of the lever which is on the catch moves downward, as shewn by the dotted lines, till it slips over the end of the catch; and thus the lever is prevented from resuming its horizontal position, till released from the catch.

In order to fit that part of the apparatus above described for action, bring the lever to a horizontal position, place the valve *g* in the circular channel at the bottom of the tub so as to cover the hole; fill the channel with mercury, and then fill the tub with water. Hence it is evident that the water is prevented by the mercury from escaping out of the tub, so long as the valve remains in its place. Now, if an explosion happen in either of the mills, the blower *e* hanging over the bed-stone, will be thrown up, and the lever will in consequence be brought into the position indicated by the dotted line, and will be retained there by the spring catches *i i*; at the same time the valves *g* will be drawn up out of the mercury, and the water in both the tubs will pour down on their respective bedstones, extinguishing in one the inflamed powder, and in the other preventing it from taking fire.

In a certain stage of the grinding the materials of the powder are apt to clot, and adhere to the runners; parts of the bed-stones are thus left bare, and the runner and bedstone coming in contact, an accidental spark may be elicited, and an explosion ensue. To prevent this most usual cause of accidents, Mr. Monk fixes to the axle of the wheel a scraper, formed of a curved piece of wood *k*, shod with copper, which being placed behind, and almost touching each of the runners, scrapes off the powder as it collects, and thus keeps the bedstone always covered.

l, is the great water wheel which gives motion to the rest.

m m, are two vertical bevil-wheels fixed on the axis of the great wheel.

n n, two horizontal bevil wheels, working in *m m*, and turning the vertical shafts, upon the upper part of which are also fixed two horizontal wheels *o o*, which drive the wheels *p p*. To the shafts of these latter wheels are fixed the runners *q q q*, which traverse on the bedstones *u u*: *v v*, are the curbs surrounding the bedstone, to prevent the powder from falling off.

The Mill A presents a view, and the mill B a section of the bedstone and curb.

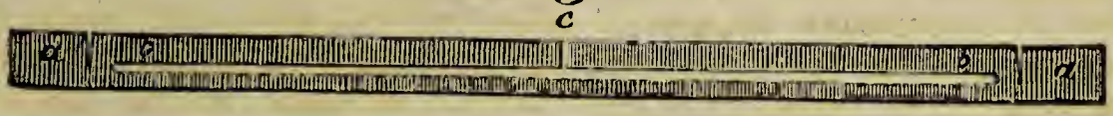
Fig. 2 shews the position of the apparatus after an explosion has taken place, the valve being raised up out of the channel, and the water pouring down on the bedstone.

It appears by the certificates of the several partners of the firm of Burton, Children, and Burton, that since these improved mills have been constructed by Mr. Monk, occasional explosions have taken place, which before generally took place under both pair of stones; but since that time, by the effect of instantaneously wetting

the powder under the contrary pair of stones, to those where explosion had taken place, a double disaster has been prevented. This invention has in the short space of three years in a single manufacturing establishment, saved eight mills from destruction, and probably many lives.

Fig. 2.

Fig. 1.



MR. SMART'S BOW AND SPRING RAFTER.

This very neat, simple and effectual method of constructing the rafters for a nearly flat roof, was invented by Mr. Smart, of the Ordnance Wharf, Westminster Bridge. The following communication, together with a model, was sent by him to the Society of Arts, in 1819; for which he received its honorary reward.

"Having long been convinced of the great utility of flat roofs, especially in London and other great towns, where space is very valuable, I have for some time turned my attention to the discovery of the most economical and effectual method of constructing them. After various experiments, I ventured to put my plans in execution on a large scale, at the premises whence this letter is dated; and the highly satisfactory result of this trial induces me to communicate some particulars of it to the Society of Arts, &c. It will give me a great pleasure to be honoured with a visit from the committee at this place, where a simple inspection of the building, will be more satisfactory than the most elaborate description. Some general idea, however, of the method which I have followed may be derived from the following particulars. Over the rafters I nailed down very strong laths, with moderate intervals between each, and laid upon them a platform of bricks bedded in cement; the bricks are covered by a layer of foot tiles laid in cement, having the joints pointed with mastic cement, and their upper surfaces twice coated with linseed oil, laid on boiling hot. The roof, although on a superficial view it appears flat, has yet sufficient declination towards the sides to allow the free escape of water; and from an experience of several months, I have reason to be entirely satisfied with its soundness. Its cost is not more than half the price of lead, and the only objection that can be urged against it, is its weight. To counteract this, I have made an alteration in the form of my rafters, which I find to be effectual; and a description of which I subjoin, as well as a model.

"I take a square spar of the usual size for a rafter, and by means

of a circular saw, make an incision in it as represented at *b*, *b*, Fig. 1; I then make the cut *c*, at right angles to the former, and equi-distant from the two ends; lastly, I make the two cuts *d*, *d*, taking out a thin wedge from each place. The two pieces *c*, *d*, are then to be gently raised up till they form an angle of 10° or 12°, with the piece *b*, *b*; and are secured in their place by the insertion of a key-wedge *e*, of seasoned oak, as represented Fig. 2. It is obvious that a weight pressing on the key-wedge of this rafter, (the ends being properly supported) will be sustained till either the fibres of the wood forming the string are drawn asunder, or till the lateral cohesion of the wood forming the butt ends of the rafters are destroyed;* at the same time there is no lateral pressure on the wall or other support."

"Ordnance Office, Westminster Bridge,
"April 24, 1824."

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir,

"As an editor, as a liberal man and promulgator of truth, I trust you you will do me justice by informing your very ingenious Correspondent W. L—y, that I will not allow him the least claim whatever to originality respecting his valuable communication on Ballooning, dated Soho, June 30th, 1824, (which he has so modestly submitted to you), it being a mere echo of what I previously laid before the public, of which that gentleman has no doubt taken some pains to send you a disguised copy. If, Sir, you will refer your readers to the 41st number of the Mechanic's Magazine, dated June 5th, signed E. W. George Street, Shoreditch, they will find the original communication, from which no doubt W. L—y, got his information.

"His description appeared in your Register July 10th, A week previous to which I sent the following letter to the Committee of the late Mr. Harris, which as well as my memory will serve me (not having a copy) reads thus:

"'Gentlemen, Having suggested an extra appendage to 'balloons, which I am of opinion will almost ensure the safety of the 'aeronaut in case of accident (a description of which appears in the '41st number of the Mechanic's Magazine), I am proud to offer my 'service to make an ascent (without any remuneration) in behalf of 'the widow Harris, and in order to render it by its novelty a scene 'of great attraction, will (after rising to a certain height), discharge 'all the gas, and instantly transform the balloon into a parachute, and 'descend as near the same spot as possible, and as such an attempt 'will be attended with more than usual danger, I desire by way of 'recompence the honour of being the first who made the experiment, 'which I consider equivalent to the risk.'"

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* The possibility of this occurring may be prevented, by so many obvious means, that Mr. Smart, no doubt, thought it necessary to mention them.

"The reason I did not succeed in my application is, that the Committee had dissolved, and the widow withdrawn her name from any further claim upon public patronage.

"I now offer my service to any other person that has a balloon upon the same conditions (namely), that he shall take all the profit to himself and I all the danger.

"As the season for aerostatic exhibitions is declining, shall esteem it a favour if you will give this a place in your next, and by so doing you will much oblige,

"Your's, &c. "E. W."

POTATOE STARCH.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir, "*August 12th*, 1824.

"The following method of obtaining starch from potatoes, treated of in your two last numbers, *on a small scale*, may probably instruct some of your readers.

"Wash your potatoes; then, by means of a common tin grater, reduce them to a pulpy mass, which put into a sieve, over a large convenient vessel, and wash well with water; the water and starch will be found in the undermost vessel, the starch being insoluble in cold water, and much heavier, will be at the bottom: pour away the super-natant fluid, and dry the starch in earthen pans, exposed to a temperature not exceeding 90°.

"I can safely aver that this starch has all the properties attributed to it by your correspondent H. L., and could but the public, especially the less opulent, in like manner be convinced, an incalculable saving might be effected. The above plan is simple and may be carried into effect by any private individual.

"Yours, &c. "B. Q."

INSPISSATED JUICE OF WORT.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Sir,

"Among the *extra provisions* supplied for the use of Captain Cook's ships, to prevent the scurvy, the *Inspissated Juice of Wort, or Malt*, is often mentioned, being for the purpose of making beer expeditiously; requiring nothing more than the addition of warm water to reduce it to the required strength, and yeast to ferment it; to produce excellent beer.

"It appears to me that the extract of Malt (and Hops) would be very useful for those who have no room to spare for the necessary utensils employed in brewing, and who would no doubt gladly avail themselves of it, provided it could be obtained at a reasonable rate.

"Perhaps some of your readers will point out, for the benefit of

the public, if it can be purchased, and where; or, if not, what the easiest method of making it.

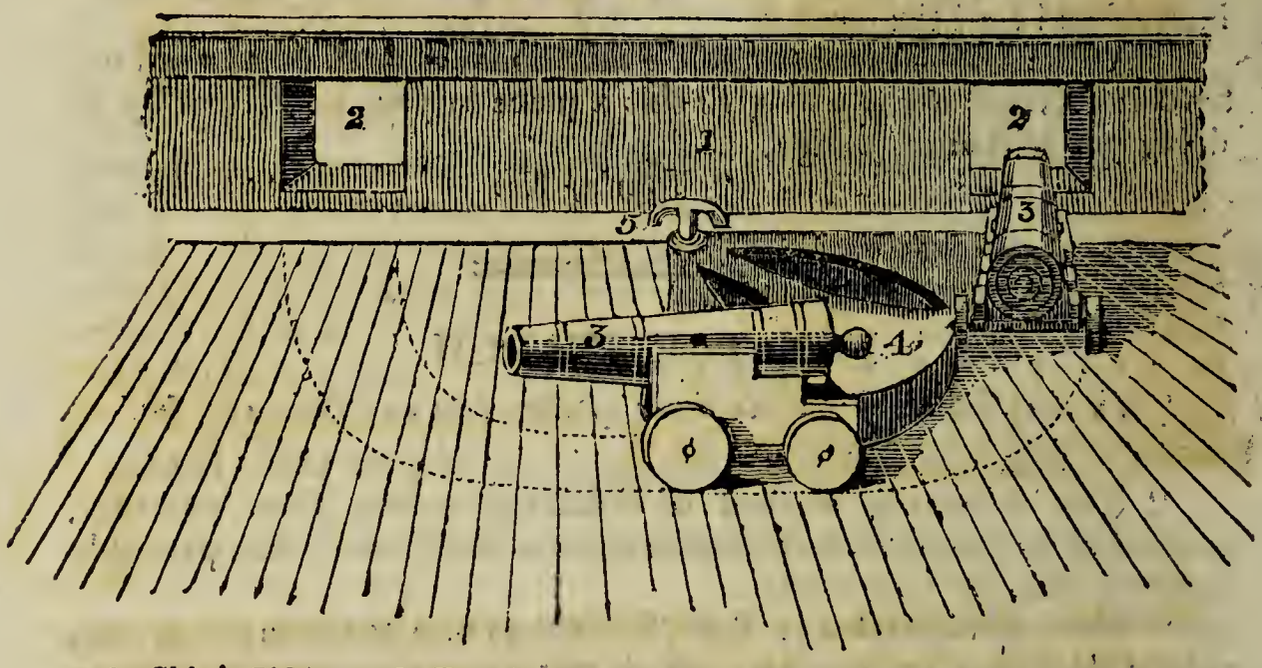
"I am, Sir,

"15, *Duke-st. Westminster,*

"Your most obedient Servant,

"18*th August,* 1824.

"W. H. REHCTIP."



1. Ship's Side. 2. Port Holes. 3. Guns. 4. Quadrant, moving on a Pivot. 5. Pivot fixed in Beam.

IMPROVED MANNER OF WORKING THE GUNS OF A SHIP OR BATTERY.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"Clapton, August 12, 1824.

"SIR—FOR some time past I have attempted, fruitlessly, what I have at last, "perseverando," in some degree attained, in the art of Gunnery. The accompanying figures, you will perceive, relate to a new system in that art, which, although but an indifferent attempt, I trust may convey pretty clearly my object in view.

"The violent recoil of guns has ever been considered to be well worthy an attempt to counteract, in some degree, their violence. This I have endeavoured to accomplish, and only wish that honest Jack could once have the handling of them.

"It will be seen, the two guns being loaded, that when the one is fired, its recoil will drive the other to its proper station, and *vice versa,* both moving upon axles affixed to the side of the quadrant. Thus counteracting the recoil, and saving continual labour in advancing them to the gunners.

"Certainly, when each is fired, care must be taken not to advance the loaded gun until its fellow be re-loaded, a work, considering its easy position, speedily executed.

"Now I challenge Jack, freely and fairly to state his objections, since I mean (to use his own terms) to have a shy for my money, in the way of a Patent, now in these 'piping times of peace.'

"I am, Sir,

"Your obedient Servant,

"WALPOLE ST. CROIX."

Fig. 1.

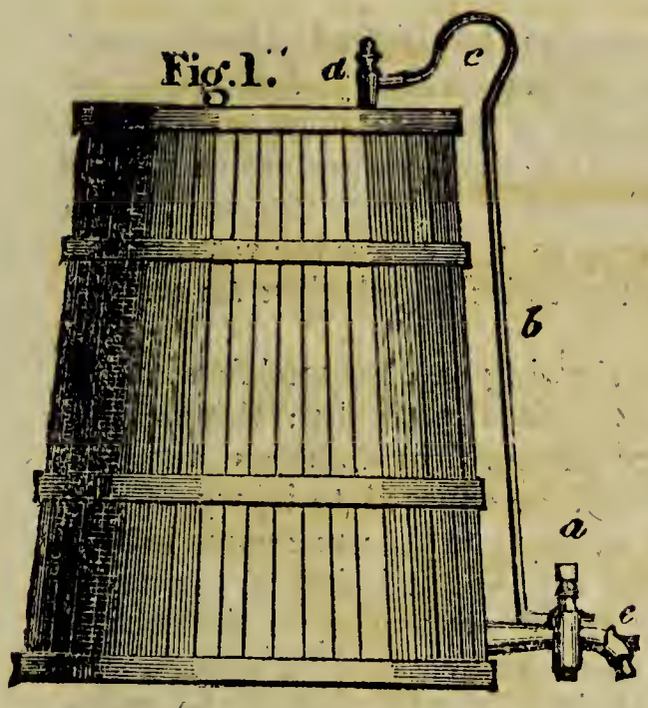
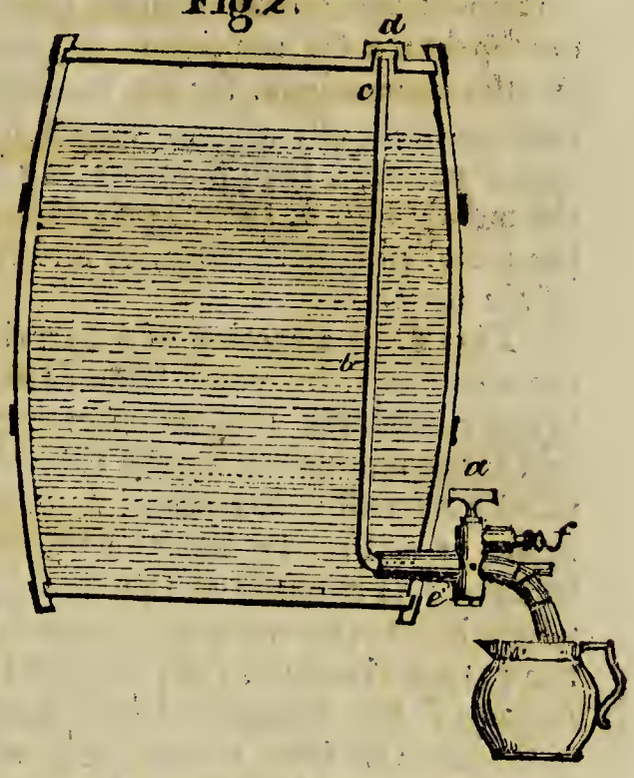


Fig. 2.



Mr. W. RUSSELL's PATENT "HYDRO-PNEUMATIC LIQUOR-COCK, WITH AIR-VENT ATTACHED."

It is well known that the admission of air by the smallest aperture into vessels containing spirits, wine, beer, and other liquors, will soon destroy all their good qualities; at first they are rendered vapid or flat by the escape of the alcohol and the carbonic acid gas, upon which depend their strength, briskness, and flavour: and afterwards, they become sour by the absorption of the oxygen of the atmospheric air, which is freely admitted through the same channel. The defective manner in which such vessels have been usually stopped has been too seriously felt by the frequent waste of large quantities of liquor, not to make it highly desirable that something should be invented, the application of which would put it *out of the power* of any person, however negligent, to produce those injurious effects upon the liquor; and we are pleased to find, that this has been fully attained by Mr. Russell's Hydro-pneumatic Cock, which is calculated to preserve liquors in their perfect state a much longer period than any other that we have as yet seen or heard of:—

It consists in the construction of an improved cock and apparatus, by means of which, all casks or vats containing fermented or other liquors may be kept perfectly air-tight; but possessing at the same time the power of admitting such portion of air only upon drawing off the liquor, as may be necessary to allow it to run out. The distinct operations of drawing off the liquor, and giving vent, are performed at the same instant of time, and by the same movement as other cocks, viz, by merely giving the handle a turn one quarter round; and upon turning the handle in the contrary direction, both the air and the liquor passages are effectually and simultaneously closed.

Fig. 1, is a view of a vat with the Hydro-pneumatic Cock and air tube applied externally. The cock, *a*, is in this instance, to a

certain extent, of the ordinary construction, but instead of having only one aperture for the liquor to pass, it has another just above it, of smaller dimensions, for the transmission of the air: upon turning the cock to draw off, the air enters into this smaller aperture above the liquor passage, then passes along its channel through the cock, into the metal tube, *b*, thence proceeding up to *c*, it enters the vat through the metal plug or ferrule, *d*, and is there discharged *above the surface of the liquor.**

Fig. 2. is a section of a barrel, shewing another modification of the apparatus, by which the air tube is placed internally; this method being considered preferable in large brewers' or distillers' vessels, and in situations where the tube would be exposed to injury if applied externally. Letters *a*, *b*, *c*, *d*, *e*, apply to the same parts in this figure as in Fig. 1; but the aperture for the admission of the air in this cock is situated at the side (at *e*): the operation of the cock is nevertheless the same with regard to the principle of the patent. In the present instance, the air aperture is so placed to allow the application of Mr. Russell's Improvement to Mr. Bramah's Patent Lock, to be made in front of the cock, as shewn in the projecting barrel, *f*. For this latter highly ingenious application and improvement, (which we shall give an account of in a subsequent number) Mr. Russell received an honorary medal from the Society of Arts.

Cheap and effectual Process for preserving Anatomical Preparations by means of a Solution of the Muriate of Soda, or common Salt, by Wm. Cooke, Esq. Surgeon.

"The process is exceedingly simple; and when I have said that it consists in putting animal substances (deprived of their blood by maceration in water) into a saturated solution of the muriate of Soda, nearly the whole is comprehended.

"I keep a saturated solution of the muriate of soda in good spring water. Every gallon of water dissolves about 3 pounds of salt.

"The specimens intended for preservation are macerated in water, frequently changed, to deprive them of the colouring part of the blood, which usually occupies three or four days or more, if the substances are large. I then place them in a solution of salt, kept in a common receptacle, to saturate them with the salt, and, as the

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* It will be perceived that the article herein described is very different in its external appearance, as well as its application, to that subsequently sold in the shops as a substitute for the Hydro-pneumatic, under the name of the Syphon-cock. In Mr. Russell's, the air is conveyed by means of a long tube to the top of the vessel or above the surface of the liquid, which keeps it undisturbed, and perfectly clear: but in the substitute above-mentioned the long tube is cut off close to the cock, so that the air is admitted at the bottom of the vessel directly into the body of the liquor; and by its forcible entrance, and bubbling upwards, it must necessarily disturb the light flocculent matter which generally floats at the lower parts of such vessels, and being thus frequently agitated, the whole contents must become more or less turbid.

water suspended in the animal structure would reduce the strength of the solution, this is counteracted by placing it in a linen bag filled with the muriate. It is kept in a linen bag to prevent the foreign matters of the salt from soiling the preparations. At the expiration of a few days they may be transferred from this vessel, into that bottle of solution which is to contain them permanently, or they may remain in the intermediate vessel as long as convenience may require. The solution in which they are finally to be kept, should be a very little below saturation. Evaporation is much less likely to happen, than if spirit is employed; yet should it occur, from any accident, crystallization would result, unless this precaution were adopted. I have added about half an ounce of very clear water to a quart of the saturated solution.

"All kinds of animal structure do not exhibit the same relative gravity when saturated with the solution; some will float, whilst others sink. In the final operation of preservation, the latter undergo the same treatment as is adopted with spirit, viz.; by supporting them with delicate threads of silk; but the former require some *body* to give them an increase of gravity.

"In almost all preparations, it is requisite to keep certain parts separated by means of quill, bristle, or other insoluble substance; instead of these, I use delicate pieces of glass, which may be obtained from the glass-blowers of every degree of fineness. These answer fully; they look neater than any thing else; can be applied with greater facility; under sufficient weight, and are of very little cost; for a few pence I purchased enough to last for some years.

"When the specimens are put into a solution of proper strength, and perfectly transparent, and the parts properly separated, to exhibit the different objects it is designed to show, the next point of importance is, to close the bottles with accuracy and neatness.

"For the reasons already stated, glass, with a medium of resin was chosen. I make the rim of the bottle perfectly dry, and spread on it some resin, with a common spatula. The glass (previously fitted) is then applied, and by holding the warm spatula pretty close to it, the resin softens, and the top is fixed with the utmost accuracy. I have thought it best to conduct this process in a moderately warm room, and the glass should be rather less than the circumference of the rim, or on lifting the bottles by the top, as is very generally done, the glass might be raised. With small bottles it is sufficient to make the resin smooth, and then varnish it; but on bottles of a larger size, additional security is obtained by attaching a slip of bladder around the edge, by means of glue. When the diameter of the bottle is large, the glass top is liable to break after two or three weeks; by using the *eye* of the glass, I have found them perfectly safe, with a diameter of four inches; and for larger I have not had occasion.

"Having been accustomed to put up anatomical preparations, I do not hesitate to affirm that the method I have now detailed, is as easy of application as any other in popular use, and I believe 10d.*

* The present value about threepence per gallon.

per gallon would not only pay for the salt, but all the other little expences with the exception of the bottle.

"I have never seen any preparation in spirit which has exhibited the membrana hyaloidea, &c. of the eye so beautifully as it is done in the solution, &c. (*Abridged from the Transactions of the Society of Arts.*)

PROCESS OF MAKING THE SCHWEINFURT GREEN DYE.

One part of verdigris is to be dissolved in a sufficient quantity of good vinegar, by heat, in a copper kettle. When it is dissolved add to the same a solution of one part of white arsenic in water. A dusky green precipitate generally ensues, which must be redissolved by the addition of more vinegar. This mixture is now to be boiled, when a granulated precipitate will be produced, of the most beautiful green colour, which after being separated from the liquid (either by filtration or by decanting after the colour has subsided) is to be well washed and dried, when it is ready for use either as a dye or pigment. If the liquor, after this process, should be found to contain more copper, more of the solution of arsenic may be added, but if it contains instead an excess of arsenic, then more of the solution of copper may be added, completing the process as before mentioned: and if the liquid should contain an excess of the acetic acid, it may be advantageously employed in the solution of more verdigris.

The colour prepared by the preceeding process is of a bluish green; but as a deeper and more yellowish green is frequently required, this is obtained by dissolving a pound of common potash in water, to which add ten pounds of the green colour prepared by the former process, and warm the mixture over a gentle fire; when the desired tint will be acquired. If allowed to boil long, the colour will approximate in hue to Scheele's green, nevertheless, as it is in all the tints, of greater brilliancy and beauty. The alkaline fluid that remains may be advantageously employed in making Scheele's green.

DICOVERIES IN THE MOON.

A certain Professor, by the name of Gruithausen, (not Munchausen as some persons have erroneously supposed, resident in Munich, has been for some little time past amusing the people with some very ingenious notions of his, all about the Moon. That his discoveries have been most luminous, cannot be otherwise than clear, when we consider the object of his contemplations. The public prints, generally, have detailed the accounts which from time to time he has given, without a comment to direct the mind of the good people to whose tastes they cater; and the gravity with which these statements are given, increases the absurdity of the whole business. We confess that the essays which the enlightened Professor

has published, have not yet reached us, but when we see observations of so startling a character as these, without a word to bring them home to the less profound, we think ourselves bound to assert the heresy with which we are infected.

We quote the pompous notice that is now running through the diurnals, to shew how learnedly it has been concocted *secundem artem*.

"Professor Gruithausen has now published the first third-part of his essay on the many plain indications of inhabitants in the Moon, and especially of a colossal building. The Munich Gazette communicates some of the most remarkable results derived from a great number of observations made last year. They answer three questions:—1. To what latitude in the Moon are there indications to vegetation?—2. How far there are indications of animated beings?—3. Where are the greatest and plainest traces of art on the surface of the Moon? With respect to the first question, it appears from the observations of Schroter and Gruithausen, that the vegetation on the Moon's surface extends 55 degrees south latitude, and 65 degrees north latitude. Many hundred observations have shown, in the different colours and monthly changes, of the parts evidently covered with plants, three kinds of phenomena which cannot possibly be explained except by the process of vegetation. To the second question, it is answered, that the indications from which the existence of living beings is inferred, are found from 50 degrees north latitude to 37 degrees, and perhaps 47 degrees, south latitude. The answer to the third question relates to the observations pointing out the places in the Moon's surface in which are appearances of artificial causes altering the surface. The author here examines the appearances that induce him to infer that there are artificial roads in various directions; and he also describes the great colossal edifice, resembling our cities, on the most fertile part, near the equator. It is remarkable, that it stands accurately, according to the four cardinal points, and that the main lines are in angles of 45 and 90 deg: and a building, resembling what is called a star redoubt, is attached to it, which the discoverer presumes to be dedicated to religious purposes; and as the selenites can see no stars in the day time (their atmosphere being so pure), he thinks that they worship the stars, and consider the earth as a natural clock."

THE COMPOSITION AND PROCESS OF MAKING SEALING WAX.

In compliance with the inquiry of a Correspondent, we annex the following formulæ for the composition of various kinds of Sealing Wax.

Best hard Red Wax for Sealing Letters.—Mix two parts of shell lac well powdered, with resin and vermillion each one part, and melt this combined powder over a very gentle fire; when the ingredients are thoroughly incorporated, work the mass into sticks.

Seed lac may be substituted for shell-lac, and instead of resin, boiled Venice turpentine may be used.

Coarse hard Red Sealing Wax.—Mix two parts of resin, one part of shell lac, vermillion and red lead together one part, the latter in the proportion of one of vermillion to two of the red lead. For a cheaper kind the vermillion may be omitted, and for very coarse uses the shell lac also.

Black Sealing Wax, is made in the same manner as red, with the exception of the colouring, the colouring ingredient for black wax being the finest ivory black.

Hard Green Sealing Wax, is the same mixture of resins and gum-resins as before mentioned; the colouring ingredient is powdered verdigris; for a brighter colour, crystals of verdegris.

Blue Sealing Wax.—Use smalts; light blue verditer, or a mixture of both.

Yellow Sealing Wax.—Use masticott; fine bright yellow, turbith mineral.

Purple Sealing Wax.—Use half vermillion and half smalts, or red and blue in various proportions, according to the tint required.

Particular attention should be paid to the ingredients while over the fire, that no more heat be given than is just sufficient for them to melt, and be thoroughly incorporated. The wax is formed into sticks by rolling it on a copper-plate or stone, with a rolling board lined with copper or tin, into rolls of any required size. The polish or gloss is given afterwards by placing the sticks of wax over a fire in a small stove, which is provided with a suitable apparatus for placing and turning them in that situation, where the heat given to them is just sufficient to melt the surface of the wax, and produce the gloss.

SCIENTIFIC AND MISCELLANEOUS INTELLIGENCE.

Impermeability of Glass to Water under high pressure.—The Rev. Mr. Campbell, in a voyage to South Africa, carried out with him two crystal globular bottles hermetically sealed, and made on purpose by Messrs. Pellat and Green, of St. Paul's Church yard. In lat. 14° 27′ N. and to the west of Cape de Verd Islands, they were sunk from on board the Westmoreland, to a depth of 200 fathoms, or 1200 feet, by means of two leads, the one of 22 and the other of 28lbs. When the rope was brought up, by the exertion of *ten* men, for a quarter of an hour, *the two globular bottles were found empty.* A wine bottle sent down at the same time, corked and plaistered over with rosin, came up full of water, with the cork inverted; five other bottles were full of water, but the corks and rosin of these were in the same state as when let down. Another wine bottle had the pitch remaining entire at its mouth; but the inside was nearly full of water, in which also the cork was swimming. The water in the inside of the bottles was not more fresh than before its entrance.—*Campbell's Second Journey in Africa.*

The Northern Expedition.—Letters have been received from Captain Parry, so late as the 2d July. The Hecla and Fury, which had sailed in company without any accident, were at that time at the entrance of Baffin's Bay. It is probable that this is the last intelligence we shall receive of our enterprising countrymen until the result of this expedition shall be known. The following letter is from an officer on board the Hecla, and is dated July 2d.

"*Whale Fish Isles, Davis' Straits.*

"As the transport is about to leave us, I address a few lines to let you know how we get on. You would be really surprised to see us. I never in my life could have imagined a ship so full, and I am satisfied it will take us one year to eat the ship tolerably clear. Only fancy to yourself forty-four quarters of fresh beef hanging about the vessel in different directions. How much more favourable every thing looks this trip than it did this time three years; we are now in 69 degrees of North latitude, without having met the least obstruction, and during the whole time we were out before we never got higher than 70. In short we were at least eighteen months before we could reach our present parallel, and we certainly have a very different prospect. Our means are good beyond every hope, our Captain able and willing, and, take my word for it, we shall either do something or lose everything. I am now writing in our mess at 12 at night with as good day-light as you have in England at noon. We shall of necessity have to pay for this next winter. The place we are at present laying at is a Danish settlement; the inhabitants are composed of Danes and Esquimaux: the latter are, in my mind, very inferior to our acquaintance of last voyage, their mixture with the Danes appearing not to have improved them. Their language and dress are much the same, and I am not aware that they differ in any material points; we shall leave this either to-morrow or next day, should the wind permit. I think in all my trips I have never seen a more barren spot than the place we are now lying at, the greater part of the land being covered with snow, and such as is clear is nothing but solid rock."

Capt. Parlby's Rifle Rockets.—Some experiments were recently made at Calcutta, by desire of the authorities there, of Capt. Parlby's Rifle Rockets. The range of the Rockets from their respective distances of 600, 800, 1000, and 1760 yards, was in general most beautiful; and in the ultimate result, establishes unquestionably the superiority of Capt. Parlby's Rifle Rockets. A very small portion of them exploded, from causes attributable, we understand, to the great haste in which at so short a notice they were necessarily prepared. A few were fired from a tube, placed at no less a distance from the target than one mile! one of which, at this amazing distance, penetrated the target; two others ranged in fine parallel lines even over the target, one of these to the distance of 2,300, and the other 2,400 yards. To the professional man it were needless to offer remarks on the consequences deducible from this successful experimental result in the department of projectiles.—*Calcutta Paper.*

Premiums of the Society for the Encouragement of Arts, Manufactures, and Commerce.—Session 1823, 1824.

EXTIRPATING THE STUMPS AND ROOTS OF TREES.—To the person who shall invent and discover to the Society the best method, verified by actual experience, of raising out of the earth, and removing the stumps and roots of trees, which have been left after felling the timber, so as to clear the land for the purposes of cultivation.—The Gold Medal, or Fifty Guineas.

WORKING DRAWINGS OF A STEAM ENGINE.——To the person who shall produce to the Society the best working drawings in plan, elevation, and section, of a condensing steam-engine in its most improved state, with a full detail of its several parts, and an accurate description thereof.—The Gold Vulcan Medal, or Thirty Guineas.

PREVENTING THE ILL EFFECTS OF SMELTING ORES.—To the person who shall invent and discover to the Society the most effectual method of preventing the ill effects arising to vegetation and animal life, from the sulphureous, arsenical, or other noxious fumes, disengaged in smelting the ores of copper, zinc, lead, tin, iron, &c. in the large way, and if possible, converting those pernicious fumes to useful purposes, in a manner superior to any hitherto known or in use.—The Gold Medal, or Fifty Guineas.

RECENT PATENTS.

To WILLIAM BUSH, of Broad-street, London, merchant; for certain improvements in the means or method of propelling ship's boats, or other floating bodies. Dated, June 29, 1824.

To JOHN BENTON HIGGINS, of Gravel-lane, Houndsditch, Middlesex, gentleman; for an improvement or addition to carving knives, and other edged tools. Dated, June 22, 1824.

To JOSEPH CLISILD DANIELL, of Stoke, Wiltshire, clothier; for an improved method of weaving woollen cloths. Dated, July 7, 1824.

TO OUR READERS AND CORRESPONDENTS.

Several Communications were necessarily delayed in the hurry of our last number; among which is a letter from W. Y——D, who dissents to the description of the *lifting pump*, given in a former number. We are sorry that we cannot give place to his observations, which, to render them more distinct, would require a copy of the sketch he has made in elucidation, the more so because we must still adhere to it. His remarks serve to increase our regret that we could not give wood-cuts illustrative of such descriptions; for, if instead of the drawing he has made, in which the piston is shewn as pushing upwards, he had thought of the lifting pump in its simplest form, he would have readily seen that a partial vacuum was formed in the cylinder of the pump by the action of the piston rod, and of course supplied by the water in which it was immersed.

We think I. A. X. wrong in his supposition.

N. N. shall be attended to.

Mr. LEAY's favor is received, and will be inserted in our next.

JUVENIS JOBSON's Communication, and that from Mr. AUSTEN, will, if possible, be also included in our next;—the drawings are in the hands of the engraver.

We have had no direct communication from the gentlemen I. P. mentions, and it would be want of courtesy to act as he suggests.

Z. A.—H. L.—W. W——D,—"A Constant Reader,"—and M. L. have been received.

Mr. CAREY's Communication is received, and will be inserted at the earliest opportunity.

FORCEPS, Mr. HINE, A. A. S., THOMAS, and B, must lie over till our next.

[*To be continued every* FORTNIGHT.]

Printed for and published by GEORGE HEBERT, 88, Cheapside; to whom all Communications (post paid) for the EDITOR are to be addressed—and Sold by SHERWOOD, JONES and Co., Paternoster Row; SIMPKIN & MARSHALL, Stationers' Hall Court; and may be had of all Booksellers in Town and Country.

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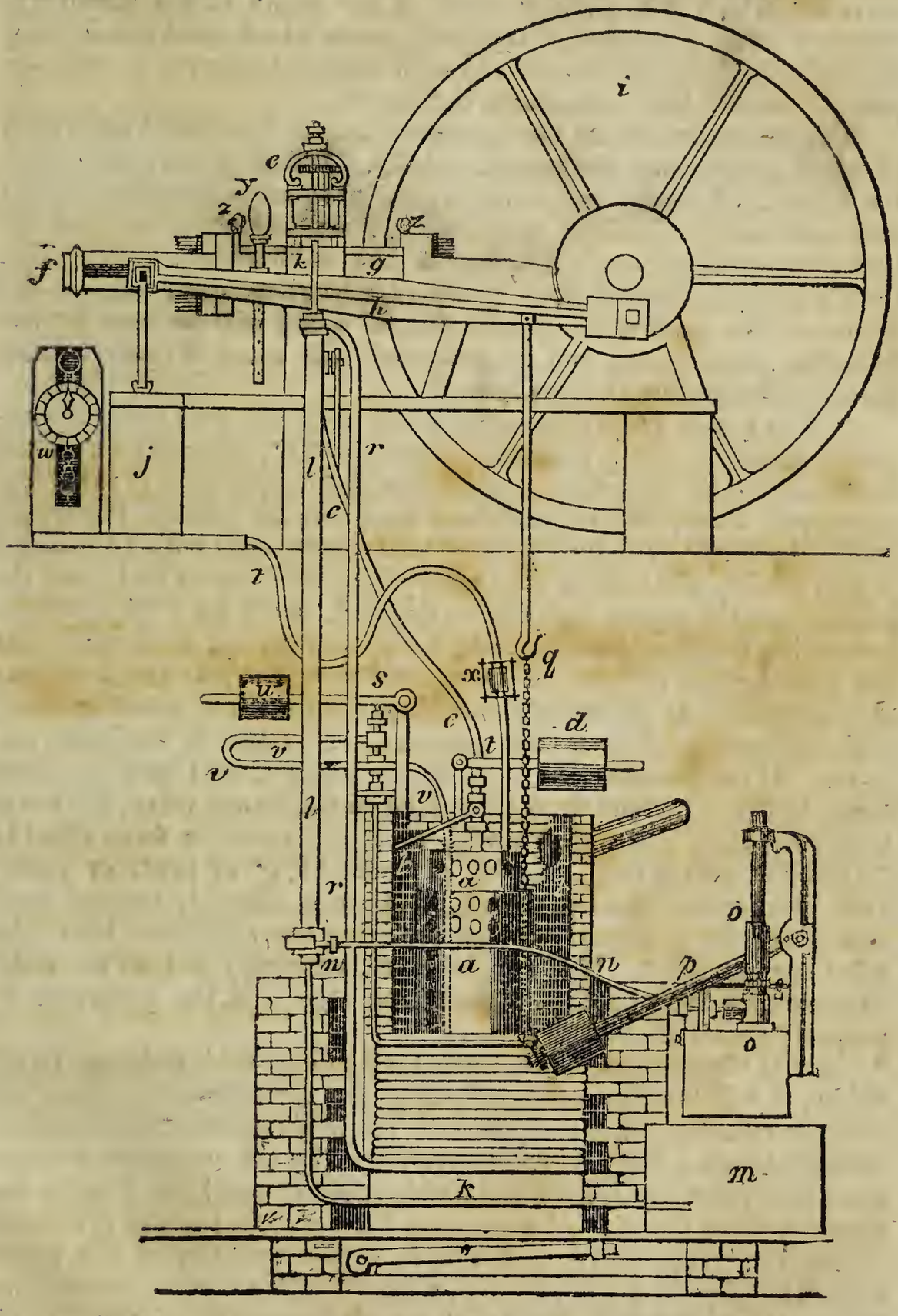
REGISTER

OF

THE ARTS AND SCIENCES,

IMPROVEMENTS & DISCOVERIES.

No. 24.] SATURDAY, SEPTEMBER 4, 1824. [Price 3*d*.



MR. PERKINS'S STEAM ENGINE.

PERKINS'S STEAM ENGINE.

Many circumstances have intervened to prevent our going so fully into the important invention which forms the subject of the present engraving. The reports which have been circulated, contradicted, believed, and refuted with respect to Mr. Perkins and his Engine, have all tended to raise expectation to a high pitch; and the public anxiety has, we believe, been fully commensurate therewith. The narrative which Mr. Perkins gives of the origin of his discovery, affords a striking instance of the facility with which great minds avail themselves of the facts connected with chemical science, though apparently of but little comparative moment.

The explosions which have occurred in iron foundries from a drop of water getting into the mould, led Mr. Perkins to speculate upon the force which would be exerted by water when sufficiently charged with heat and confined by pressure. A well-drawn article and detailed account has been published in the Bibliothéque Universelle, from which is extracted such parts as will give a clear idea of the nature of the engine, the operations of which will be seen by the following description, and be rendered still more obvious by the observations of Mr. Perkins himself.

"It is a well known fact that water does not boil under atmospheric pressure until it has been heated to 212°, after which all the heat that can be applied cannot increase the temperature of the steam or water. Now, add an artificial atmosphere by loading the escape valve (the surface of which is equal to a square inch) with 14 lbs. and it will receive 250 of heat with a very little addition of fuel, and the pressure on the square inch will be doubled, or 28 lbs.; the mechanical action will not be double, yet it will be increased much more than the consumption of fuel. Let the valve be loaded with two additional atmospheres or 42 lbs. and the temperature will be raised to 280°, and will again produce double pressure, or 56lbs. in the inch, and so on. If the generator be made strong enough, as I have no doubt it may be, to withstand 60,000lbs. load on the escape valve, the water would not boil, although it would exert an expansive force equal to 56,000lbs. on the inch, and be at about 1170° of heat, or cherry red. Water thus heated would, if it were allowed, expand itself into atmospheric steam, without receiving any additional heat from what surrounded it. It is not, however, necessary to heat the water to more than 500° to have it flash into steam, if the generator be properly constructed."

a a is the generator, kept constantly filled with water up to the valve; *b b* is the furnace surrounding the generator, by which the water it contains is intensely heated, but is prevented from escaping, notwithstanding its great expansive force, by the enormous pressure upon the valve by the variable weight *d*; or until the pump *o* has forced a given quantity of water into the lower part of the generator, which raises the valve, and causes a like quantity of the heated water to escape into the pipe *c c*, where flashing instantaneously into steam, it rushes into the cylinder *g* and drives the piston *f* to the

farthest end of it; this action causes a communication to be opened into the pipe *k* into which the steam passes; the pipe *k k* passes through the condenser *l l*, delivering out its heat to the cold water contained therein; from thence after descending it takes an horizontal course and enters the reservoir *m*, from whence it is repumped for use by the apparatus *o o*.

The arm *h* is attached at one end to the piston *f*, and is consequently moved by it in an horizontal line the length of the cylinder *g*, and the other end of the arm being connected with the fly wheel *i*, causes it to revolve; the fly thus put into action gives motion to the rotatory valve *e*, which opens and shuts alternately a communication on both sides of the piston. An iron rod and chain *q* being fixed to the arm *h*, and at the other end to the loaded lever *p*, the pump *o* is worked by the action of the arm, causing at every revolution of the fly a fresh quantity of water to be forced into the bottom of the generator, which again raises its loaded valve, and allows the escape of an equal quantity of water into the pipe *c c*, where flashing into steam, and rushing into the cylinder, it operates upon the piston again and keeps up the alternating and rotatory motion of the several parts before mentioned.

The condenser *l l*, is a tube of copper about 4 inches in diameter and 20 feet long, and is supplied constantly with cold water from the pump, through the pipe *n n*, which enters the condenser at the lower end, and is discharged at the upper end into the descending tube *r r*, which proceeding to the lower part of the apparatus, ascends in a spiral winding of many coils round the bottom of the furnace up to the valve *s*, which is also loaded by a variable weight *u*, equal to 700 lbs. upon the square inch (or about 50 atmospheres); from the valve *s*, the tube descends as at *v v v*, and proceeds to nearly the bottom of the generator, as shewn by the dotted lines. In order to insure safety to the apparatus a tube *t t*, is fixed to the generator and proceeds to the dial *r r*, which shews the degree of pressure in the number of atmospheres with which the machine works; at nearly the middle of this tube is fixed a safety valve of copper *x*, which is torn up when the pressure greatly exceeds the intended force. The atmospheric air contained in the spaces on each side of the piston escapes by tubes at *z z*, which are furnished with stop cocks. Since the drawing of the Engine was made we understand that Mr. Perkins has made some great improvements in the generator, which is now formed of one entire piece of wrought iron; also instead of a single condensing tube as here shewn, Mr. Perkins now employs several; and the improvements in other respects are so decided, as to render it necessary for us to lay before our readers one of his improved engines, which we shall take the earliest opportunity of doing.

IMPROVED CENTRIFUGAL CHECK-HOOKS.

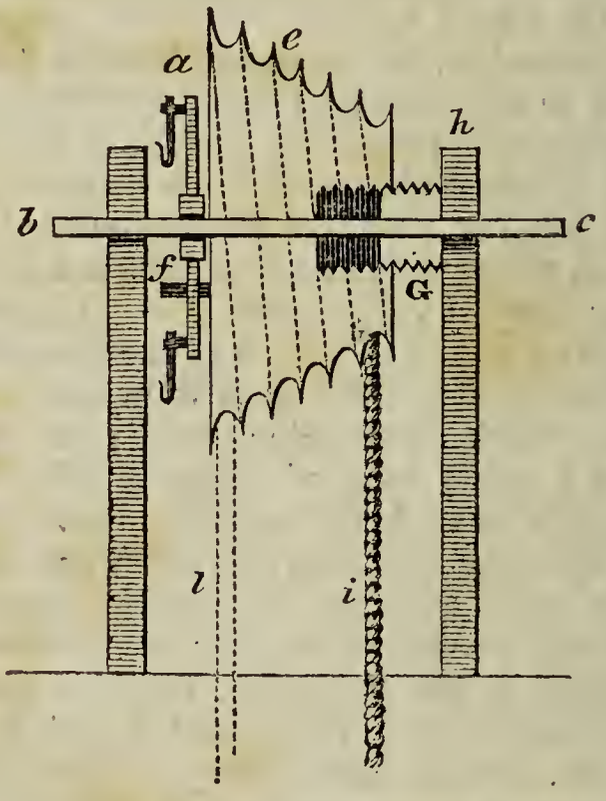
In our 11th No. p. 169, we gave an account of Mr. Speers's "Centrifugal Check-hooks," a very simple yet useful contrivance for the prevention of accidents in raising men and minerals out of the

shafts of mines, owing to the ropes "running wild.' In this account we ventured a hint at a very desirable improvement, but without mentioning the means by which it could be effected: several ways occurred to us which we purposed submitting to our readers at some future time; but we are so far excelled by the highly ingenious plan of our correspondent, whose communication we annex, that we are are much pleased in offering it as a substitute.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"In your Eleventh Number you have inserted a description and engraving of Mr. Speers's Centrifugal Check Hooks, and have concluded the description with a remark, that some degree of elasticity should be given to the check-bar, in order to lessen the shock occasioned by the sudden stopping of the machinery. The subject of my present communication is a plan (an humble invention of my own), by which this defect would be obviated, and at the same time another decided superiority would be gained, which is, that when the velocity of the revolving wheel was so far reduced as completely to set danger aside the machinery would not stop, but would recommence motion, always checking itself when it should have acquired a certain velocity.



"In the above drawing, A is a section of Mr. Speers's Check-Hooks, as described in your 11th No.; the bar to which the hooks are suspended turns with the axle B, C. E is a conical pulley with grooves cut in a spiral direction as represented in the section; this pulley turns on the axle and not with it like the bar A. Out of this pulley at F proceeds the check-bar. G is a screw fixed to the frame H, which fits into the pulley E, so as to enter it as soon as the pulley is made to revolve in the same direction as the bar A. I is a cord fixed to the pulley E so as to be wound round all the grooves when the pully is turned; to the end of it is fixed a weight, the

size of which must be regulated according to the velocity with which the machine is required to work.

"Now it is evident from an inspection of the above plan, that when the Check-Hooks, by the too rapid revolution of the check-bar A, should have diverged so far from their natural position as to catch the check-bar F, the pulley E would be drawn round in the same direction as the bar A, and evidently would wind the weight suspended by the cord I, until the cord had reached the outermost groove as at L, when the machinery would be reduced to a proper velocity; at the same time the pulley E would be so far drawn back by the screw G entering it, as to have drawn the check-bar F out of the reach of the Check-Hooks, when the machinery would proceed in the regular way, and the cord I by means of the weight attached to it, would, by turning round the pully F resume its original position as shown at I, being always ready to regulate the machinery when the Check-Hooks should have so far diverged from their natural position as to catch the check-bar F.

"If you consider the above as deserving a place, I should be glad to see it in the Register of the Arts and Sciences.

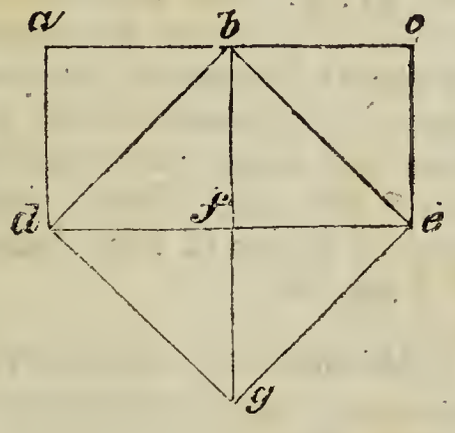
"Yours, &c.

"*Aug.* 16, 1824. "W. LEAY."

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR,

"HAVING observed that a claim has been made to the invention of a Wind Bed, I beg to submit the following extract from a book entitled the Enchiridion of Fortification. Printed in 1645 for Richard Royston, and to be sold at the sign of the Angel, in Ivie Lane.



"'Having gone through the principall heads of fortification, and 'other matters tending to action, I thought it would not be very 'impertinent to end with repose, that being, as it were, the whet-'stone to the former; and thus I have figured it—Two officers 'sleeping on a bed made of leather, wind tite, and blown up to 'bear them from the damp and unwholesome humidity of the earth, 'the which from its quality I call a *Ventilet*, signifying a bed of 'wind. That they are now any where in use I know not; but that 'they have been in use I am certain; and that it is possible and 'very convenient I am most certain; for being made of neat's lea-

'ther, and six foot square, the wind being let out, it will be of good 'use to cover a sumptier, and so earn its carriage.

'The diagram on the table directs the making of it thus: provide 'you two large neats hides, out of which you must cut two peeces 'in form of the parallelogram—*a*, *c*, *d*, *e* being between eight and 'nine feet long and four broad, that the corners *a* and *c* being dou-'bled over and joyned *a*, *f*, the line *d*, *b*, and *b* & *b*, *e*, which must 'be two sides of the bed; then having sowed the seam *d f* fast and 'close. In sowing the two pieces together in the diagonal seame *d* '*c*, place the same diagonal alternate, to wit, *b f* on the one side 'and *f g* on the other; the corners ought to be rounded off to 'gain a thicknesse; at one of these corners it must be left open 'with a gut of thin subtile leather fastened into it, in which must 'be fastened a little block with a scrue hole through it, just fitted 'to the nozzle of a pair of bellows, blow it up till it is harder or 'softer to your humour, then with a small leathern thong between 'the nose of the bellows and the bed choak it close, then scrue in 'a stopple, and remember to put off your spurs and doubless, it will 'contain the wind, and bear you with much care from the cold ground.'

"By inserting the above in your Register, you will oblige,

"JUVENIS JOBSON."

FLOATING BREAKWATER.

"*To the Editor of the Register of the Arts and Sciences, &c.*

"SIR, "*Harrow, Aug.* 25, 1824.

"As your useful publication, as well as other cotemporary Journals, has mentioned Mr. White's Floating Breakwater as a new invention, I wish to refer you to the Repertory of Arts for September 1823, vol. 41, p. 206, wherein it will be found that Mr. DAVID GORDON took out a patent for *Improvements on Floating Breakwaters*, so long ago as January in that year. Upon a reference also to Martin's Circle of Mechanical Arts, p. 311, it will be seen that General Bentham had many years previous proposed that a Floating Breakwater for Plymouth Sound should be constructed of wooden floats anchored by means of iron chains.

"I am, Sir, "A. F. B."

TO OUR READERS AND CORRESPONDENTS.

W. S. C.'s Communication is not in a sufficiently tangible form for publication; there is also another difficulty which will be explained to that gentleman if he will have the goodness to call at our Publisher's.

The several Communications from A. Z.—H. H.—TAR PAULIN.—W. H.—and R. H. have been received.

Mr. BLYTH's and MR. CAREY's Favors are intended for early insertion.

[*To be continued every* FORTNIGHT.]

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